BAND SHARPENER CONTROL

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ABSTRACT OF THE DISCLOSURE

A sharpening apparatus having a pair of power driven concurrently rotating and laterally moving grinding wheels operable to successively sharpen the cutting edges of moving endless bands of a bread slicing machine. Each grinding wheel is mounted for rotation about an axis extended generally normal to the plane of movement of the cutting edge and is driven by a motor. A control connected to the motor is operable to vary the speed of rotation of the grinding wheel providing a variation in the grinding from a heavy grinding action to a light grinding and honing action.

BACKGROUND OF INVENTION

The cutting edges of the bands of a bread slicing machine must be periodically sharpened for efficient and effective slicing of bread. Honing machines have been developed to sharpen the cutting edges of the bands of a bread slicing machine. Examples of these honing machines are shown in the patent to Hansen No. 2,961,809 and the patent to Boitscha No. 2,997,826. The sharpening action on the bands by these machines is a honing or polishing action which results in localized wear of the hone and loading up of the hone with the metal. This honing action removes the burrs from the cutting edges with the result that even after the honing the bands will not efficiently cut bread. A sharp bread slicing band has numerous fine teeth or burrs which provide a sawing action in the cutting or bread. Since the prior art honing machines do not produce these burrs on the band the bands must be removed from the slicing machine and ground to produce the proper cutting edge. The sharpening apparatus of the present invention produces the necessary burrs on the bands without removing the bands from the slicing machine.

In my co-pending application, Ser. No. 551,441, for Band Sharpener, now U.S. Pat. No. 3,425,170 there is shown a band sharpening apparatus having a pair of power driven grinding wheels which rotate about an axis generally upright to the direction of movement of the bands. The sharpening units are mounted on moveable members to transport the sharpening units transversely of the bands. As the sharpening units move, the grinding wheels sequentially move across the cutting edges of both sides of the bands to provide positive grinding or cutting action which produces fine teeth or burrs. The control means of the present invention is an improvement of this structure which enables the user to regulate the amount of metal that is removed from the bands permitting a gentle grinding and honing action to touch up the bands as well as a coarse grinding action to place a new cutting edge on the bands. This control of the grinding improves the grinding effectiveness of the bands and increases the life of the bands which never have to be removed from the slicing machine until worn out.

SUMMARY OF INVENTION

The invention broadly relates to a moving power driven grinding apparatus and method to regulate the grinding action on a moving cutting edge. More particularly, the invention relates to an endless band sharpening apparatus having movable power driven grinding wheels and a control system for regulating the speed of rotation of the grinding wheels to provide for a heavy grinding action and alternatively for a concurrent light grinding and honing action. The apparatus is operable to sharpen the cutting edge of an elongated cutting member or band moving in the longitudinal direction of the cutting edge. Extended transversely of the cutting member is a support carrying a sharpening unit capable of being moved transversely of the cutting member. The sharpening unit has a grinding wheel rotatably mounted for rotation about an axis generally normal to the direction of movement of the cutting edge and a motor for rotating the wheel. The speed of the motor is regulated by a control whereby the speed of rotation of the grinding wheel can be changed. This enables the user to regulate the amount of metal that is removed from the cutting edge by changing the speed of the motor. A gentle grinding and honing action is achieved with low speeds to touch up the cutting edge. At high speeds larger amounts of metal are removed equally from both sides of the cutting edge producing a new cutting edge.

IN THE DRAWINGS

FIG. 1 is a side elevational view of a bread slicing machine equipped with the band sharpening apparatus having speed controls for the power driven grinding wheels of this invention;

FIG. 2 is an enlarged sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged side view partly in section of one power driven grinding unit of the sharpening apparatus;

FIG. 5 is an enlarged sectional view taken along the line 5—5 of FIG. 4;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 3 showing the grinding wheels engaging the cutting edges of the bands;

FIG. 7 is an enlarged fragmentary sectional view taken along the line 7—7 of FIG. 6 showing a peripheral portion of a grinding wheel engaging an end band.

FIG. 8 is a sectional view taken along the line 8—8 of FIG. 7;

FIG. 9 is an electrical-mechanical diagram of the control system for the drive mechanism and the sharpening units of the apparatus of this invention; and

FIG. 10 is a diagrammatic view of the reversing switch for the drive motor of the control system.

Referring to the drawings there is shown in FIG. 1 a bread slicing machine indicated generally at 15. Machine 15 is a conventional bread slicing machine having a frame 16 which includes angularly disposed pairs of side members 17 and 18. Transversely positioned between the bottom ends of side members 17 and 18 is a lower drive drum 19 mounted on stub axles 21 and 22. As shown in FIG. 2, stub axles 21 and 22 are threaded through supports 23 and 24 mounted on the side members 17 and 18 respectively. The forward ends of stub axles 21 and 22 project into recesses in the ends of a stationary shaft 25 extended axially through drum 19. Stub axles 21 and 22 are removable from shaft 25 to permit replacement of drum 19 and endless bands about the drum. Rotation of stub axles 21 and 22 is facilitated with the use of transverse rods 26 projected through suitable holes in the ends of the stub axles.

Referring to FIG. 1, transversely located between the upper ends of the side members 17 and 18 is an upper drum 26 mounted in bearing blocks 27 adjacently carried on the upper ends of side members 17 and 18. Adjustable assemblies 28, as nut and bolt units are used to adjust and hold the longitudinal position of upper drum 26 relative to the side members. A plurality of endless metal bands 29 are trained about the drums 19 and 26.
The reaches or runs of each band between the drums are twisted 180 degrees so that the center sections of the reaches are substantially perpendicular to the planes of movement of the reaches. Bands 29 are axially spaced on drums 19 and 26 with center sections of the reaches of the bands forming a transverse cutting edge. The forward cutting edges 30 of the bands provide a series of axially spaced cutting edges. Shown in FIG. 7, cutting edge 30 of band 29 has a scalloped or sinuous shape. Rearwardly projected fingers 31 and 32 are used to space and centrally align the center sections of the reaches of endless bands 29 from each other. Guides 31 and 32 are located between tables 33 and 34 and used to guide a load of bread 35 through the cutting zone of the machine.

Lower drive drum 19 is driven by an electric motor 36 mounted on frame 16. Power is transmitted from motor 36 to drum 19 by an endless belt drive 37 trained about one end of drum 19 and the drive pulley of the motor. In use the rotating drum 19 moves endless bands 29 at a rate of speed of approximately 1200 feet per minute. Over a period of use cutting edges 30 of the endless bands become dull and must periodically be sharpened to provide effective and rapid cutting of the bread. A properly sharpened band has a cutting edge with numerous fine teeth or burrs which in use establish a sawing action on the bread making a clean cut. A reduction or elimination of the burrs results in a rounded cutting edge which will not effectively cut bread.

The apparatus including generally at 38 in FIGS. 1 and 3 is operable to automatically sharpen cutting edges 30 of each band and provide the cutting edges with the necessary burrs. Sharpening apparatus 38 is a self contained assembly mounted on machine 11 adjacent drum 19. The apparatus can be mounted on any endless cutting machine with a minimum of time and labor. Sharpening apparatus 38 has sharpening units, indicated generally at 39 and 41, which move along transverse axes extended generally parallel to the axis of rotation of drum 19. Sharpening units 39 and 41 are operable to sharpen the upper and lower surfaces of the cutting edges on the forward portion of the endless bands. As sharpening units 39 and 41 move transversely along their respective axes they sequentially sharpen the cutting edges on adjacent bands. The sharpening units move at a relatively slow rate of speed so that the entire cutting edge of each moving band is sharpened.

Sharpening units 39 and 41 are movably mounted on a support indicated generally at 42 secured to opposite ends of the drum shaft 25 and extended transversely of the drum. Support 42 guides the sharpening units 39 and 41 for movements in directions transverse to the direction of movement of bands 29 and carries the sharpening units in unison sequentially across the bands.

As shown in FIG. 2, support 42 comprises arms 43 and 44 located opposite the ends of drum 19. Clamps 46 and 47 secure the arms to the outer ends of the stationary shaft 25 extended through drive drum 19. Arms 43 and 44 are offset outwardly away from the drum and project upwardly. They are used as supports for a transversely extended first movable member 48, as a worm or rod having a screw thread. Bearings 49 and 51 rotatably mount the opposite ends of member 48 on the arms 43 and 44, respectively. As shown in FIGS. 2 and 3, member 48 extends substantially parallel to the axis of rotation of drum 19 and is located between the upper and lower reaches or runs of endless bands 29. Positioned below and extended substantially parallel to member 48 is a guide rod 52 carried by adjustable support members 53 and 54, as nut and eye bolt assembly 55. Guide rod 52 is provided with a hole to accommodate an adjustable support member 54 secured to arm 44. A similar ear carrying an adjustable support member is secured to arm 43. The adjustable support members are movable to change the position of the guide rod relative to the bands.

A second movable member 58, as a worm, extends transversely across the upper reaches or runs of endless bands 29. Member 58 is substantially parallel to the axis of rotation of drum 19. As shown in FIG. 2, the right end of member 58 projects through a bearing secured on upright member 60. The lower end of member 58 is secured to top side of arm 44. The opposite end of member 58 is rotatably mounted in a bearing secured to an upright plate (not shown) mounted on frame 18. Located below and forewardly of member 58 is a top guide rod 64 carried on an adjustable support member 66 in a manner similar to the nut and eye bolt assemblies forming support members 53 and 54.

The upper and lower sharpening units 39 and 41 are identical in structure with the upper sharpening unit mounted on worm 58 and guided by guide rod 64. Lower sharpening unit 41 is mounted on worm 48 and guided by lower guide rod 52.

The following detailed description is limited to sharpening unit 39 shown in FIGS. 4 and 5. The corresponding structure in sharpening unit 41 is indicated with the same reference numeral by the suffix A. A square block or nut 73 is threaded onto member 58 supporting a step plate 74 secured to the bottom of the block by bolts 76. Located adjacent the lower end of plate 74 is an upwardly directed step bracket 77 projected over and engageable with the top of guide rod 64. Bolt and nut assemblies 78 secure the bracket to plate 74. Imposed between bracket 77 and the top of plate 74 is a curved leaf spring 79 engaging the bottom of the guide rod 64. Spring 79 biases the plate in a downward direction toward endless bands 29.

An abrading member 81, a cone-shaped grinding wheel, located below plate 74 is mounted for rotation about an axis extended upwardly from the longitudinal direction of blades 29. Abrading member 81 is carried on an upright shaft 82 rotatably mounted on the end of plate 74 and a cover 83 by a pair of bearings 84. An electric motor 86 mounted on plate 74 is connected with belt drive 87 located within cover 83 to drive shaft 82 of abrading member 81. Motor 86 may be replaced with an air driven motor operably connected to drive shaft 82. The position of abrading member 81 relative to bands 29 is maintained by guide rod 64. Spring 79 biases the forward portion of the abrading member downward into engagement with the bands and provides the abrading member with floating movement. As shown in FIG. 4, the flat cutting bottom surface 88 of abrading member 81 is angularly inclined with respect to the direction of movement of bands 29. This angle is preferably 7 degrees but may vary with different shaped abrading members.

Referring to FIG. 5, there is shown a drive mechanism indicated generally at 89 for rotating the movable members 48 and 58 whereby the sharpening units 39 and 41 move transversely over moving bands 29 with the abrading members 81 and 81A moving in unison across the top and bottom sides of the cutting edges of the bands 29. Drive mechanism 89 comprises an upright electric motor 90 having a rotor 91. A brake disc 91A is secured to the lower end of the rotor shaft and engages the bottom wall of the motor housing when the motor is de-energized. Disc 91A and motor housing function as a brake for the rotor. When the motor is energized rotor 91 shifts upwardly moving disc 91A away from motor housing. Motor 90 drives a speed reduction gear box 92 mounted on a support 93 projected rearwardly from the upright member 60. Gear box 92 has an output shaft 94 carrying a sprocket 96. A screw and friction plug 97 provide a friction drive connection between sprocket 96 and shaft 95. This drive connection functions to limit the amount of torque which may be applied to members 48 and 58. Power is transmitted from sprocket 96 to sprockets 98 and 99 mounted on the ends of members 48 and 58 respectively by a roller link chain 101 trained about sprockets 96, 98 and 99.
The direction of rotation of motor rotor 91 is controlled by limit switches 102 and 104 mounted on opposite sides of support 32. Limit switch 102, mounted on support 93, has an actuator finger 103 projected in the path of movement of sharpening unit 39. When sharpening unit 39 engages finger 103 units 39 and 41 are in the initial at rest position. Limit switch 104 mounted on clamp unit 63 has an actuator finger 106 located in the path of movement of the sharpening unit 39. When sharpening unit 39 engages finger 106 units 39 and 41 have reached the end of their forward movement. Limit switch 104 operates in conjunction with a reversing switch indicated generally at 107 in FIG. 10 to change the direction of the rotation of the drive motor 90. This reverses the rotation of the members 48 and 58 thereby driving sharpening units 39 and 41 back toward limit switch 102.

Referring to FIG. 9, there is shown the electrical-mechanical diagram of the drive mechanism for members 48 and 58 and the electrical control system for motors 86 and 86A of the sharpening units and reversing motor 90. A source of electric power 105 is connected to starting capacitor unit 109 of motor 36 used to drive drum 19. The electric energy for the control system of the sharpening apparatus is derived through capacitor unit 109 so that drive motor 36 will rotate drum 19 moving the bands 29 before energy is supplied to the sharpening unit motors 86 and 86A.

A safety fuse 111 is interposed in a line 112 connecting capacitor unit 109 to a safety switch 71 which must be in the "on" position before electric current is supplied to manually operated starting switch 113. Switch 113 is connected to motor speed control means indicated generally at 140 comprising a first control 141 for motor 86A and a second control 142 for motor 86. A line 143 electrically connects the switch 113 to controls 141 and 142. Motor 86 is connected to control 142 with a line 114, as a longitudinally coiled electrical cord. A line 116, similar to line 114, connects motor 86A with control 141. Controls 141 and 142 are separate identical electronic motor speed control operable to permit changes in motor speed from 0 to full speed without losses in motor torque. The controls each have dial knobs manually set to establish the speed desired. An electronic feedback maintains the selected speed by increasing the voltage to the motor as the load increases. An example of a suitable unit for control 141 is the motor speed control Model 4X796 made by the Dayton Electric Manufacturing Co., Chicago, Ill.

Switch 102 is connected to controls 141 and 142 with line 122 so that when switch 113 is open the circuit to control 141 and 142 is interrupted thereby switch 102.

A timer 144 connected in parallel with switch 113 is operable to by-pass switch 113. The timer has interval controls operable to close the electric circuits to the controls 141 and 142 energizing the grinding motors 86 and 86A and drive motor 90. It is used, the time is set to operate in two hour intervals to automatically sharpen the bands. Other time intervals can be used as required to keep sharp cutting edges on the bands.

The circuits for motors 86 and 86A are completed by a line 117 connecting the motors to capacitor unit 109. Reversing switch 109 is connected to limit switches 102 and 104 by lines 118 and 119. The circuit through reversing switch 107 is completed by a line 120 connecting the reversing switch to line 117. Switch 102 is connected to a line 121 by line 122 which by-passes switch 113 providing limit switch 113 with a live first contact held in the circuit by line 119. Limit switch 102 is a double acting switch having oppositely acting first and second contacts. Second contact works opposite to the first contact to connect the line 118 to power line 122 when the first contact is held open.

Reversing switch 107 shown in FIGS. 9 and 10 has a pair of angularly movable contacts 123 and 124 located between pairs of stationary contacts 125, 126 and 127, 128 connected by lines 129 to the field and armature windings of reversing drive motor 90. A U-shaped frame 130 is used to pivotally mount the movable contacts 123 and 124 and support the stationary contacts 131 and 132 operable to control the "on" and "off" positions of contacts 123 and 124. Line 118 is connected to solenoid 131 and line 119 is connected to solenoid 132. Moveable contacts 123 and 124 are held in their alternate "on" positions, as shown in FIGS. 9 and 10, by a pair of interlocking fingers 133 and 134 which act as interlocking nose positions energization of the oppositely located solenoid.

In use, to sharpen the cutting edges 30 of bands 29, motor 36 must be running to rotate drum 19 thereby moving bands 29 in separate longitudinal paths. The sharpening apparatus is manually energized by closing starting switch 113 thereby engaging the source of electric power to controls 141 and 142 for motors 86 and 86A and to reversing motor 90. Timer 144 is automatically operable to connect the source of power to controls 141 and 142 to reversing motor 90. With switch 113 closed or timer 144 closed, limit switch 112 couples switch 113 to line 118 thereby energizing solenoid 131. The pull of solenoid 131 releases lock fingers 133 and 134 and moves contacts 123 and 124 into engagement with stationary contacts 126 and 128 whereby drive motor 90 is energized and transmits power through drive link chain 101 to move members 48 and 58 which in turn move sharpening units 39 and 41 transversely across the top and bottom runs of bands 29. Motors 86 and 86A drive abrading members 81 and 81A about separate upright axes with the forward portions of the abrading members engaging the cutting edges 30 of adjacent bands.

Starting switch 113 is momentarily held in the "on" position until the sharpening units 39 and 41 move from the rest position allowing limit switch 102 to return to the "on" position. When switch 102 is in the "on" position starting switch 113 is by-passed and the second contact in switch 102 is open de-energizing solenoid 131. Lock fingers 133 and 134 hold the movable contacts 123 and 124 in engagement with fixed contacts 126 and 128 whereby motor 90 drives members 48 and 58 moving the sharpening units 39 and 41 at a uniform rate of speed transversely across bands 29. The units 39 and 41 move at a relatively slow rate of speed so that the abrading members 81 and 81A engage the entire length of the cutting edge of each band.

As shown in FIG. 3, sharpening units 39 and 41 are angularly movable about the axes of members 48 and 58 and are biased by springs 79 and 79A in a downward direction forcing the abrading members 81 and 81A into engagement with the cutting edges of one to three bands 29. The abrading bottom surfaces 88 and 88A of the abrading members project in planes which intersect the moving bands at a small angle whereby the forward edges of the abrading members 81 and 81A are in abrasive contact with the cutting edges 30 of at least one band 29. The abrading members may contact a plurality, as three, bands at the same time. As shown in FIG. 7, the cutting surfaces of the abrading members move transversely across the cutting edge 30. This provides for self cleaning of the cutting surfaces 88 and 88A. As shown in FIGS. 1 and 6, bands 29 being in a figure 8 loop twist and turn from horizontal to vertical positions as they move in their paths and around drums 19 and 26. This exposes only the cutting edges 30 to the action of the abrading members. As the bands enter and leave drive drum 19 they are at a slight angle with respect to tangents to the peripheral surface of the drum. With the abrading members the abrading members engage only the scalped cutting edges 30 of the bands. The support 42 being attached to drum shaft 25 fixes the locations of the abrading members relative to the bands thereby eliminating adjustment of the apparatus on the machine to control the sharpening of the cutting edges of the bands.

As members 48 and 58 rotate sharpening units 39 and 41 move transversely of the direction of movement of
bands 29. When the sharpening units have moved across the last band, unit 39 engages the reverse limit switch actuator finger 106 moving the finger from the "off" position to the "on" position whereby solenoid 132 is energized. The pull of solenoid 132 moves the movable control unit 123 and 124 to engagement with opposite stationary contacts 125 and 127 whereby electric motor 90 is reversed driving members 48 and 58 in reverse directions. When this occurs sharpening units 39 and 41 moves transversely back across bands 29 to complete the cycle. On reverse movement of the sharpening units the sharpening members 81 and 81A engage the cutting edges of the bands. When the sharpening unit 39 engages actuator finger 103 of limit switch 102, motors 86, 86A and 90 are de-energized terminating power to members 48 and 58 as well as abrading members 81 and 81A.

As shown in FIG. 3, when motor 90 is de-energized, rotor 91 moves axially downward until disc 91A engages the end of the motor housing to brake the transmission gear box 92. This braking action overcomes the momentum of the moving members 48 and 58 and chain 101. The brake prevents sharpening units 39 and 41 from moving beyond their at rest positions.

The speed of rotation of the grinding wheels 81 and 81A is separately regulated by the controls 141 and 142 respectively. These controls are manually set to drive the motors 86 and 86A at full speeds or terminate the power to do so whereby the grinding wheels are permitted to run. The nonpowered grinding wheels as they move transversely across the cutting edge of the bands function as light grinding and honing action to polish the cutting edges. Under these gentle sharpening actions the cutting edges will be touched up and thereby increase the life of the bands. The knobs of the controls 141 and 142 are selectively regulated to control the respective speeds of the motors 86 and 86A so that the grinding edges on the opposite sides of the bands can be selectively regulated. At full speed the grinding wheels function to take a heavy or rough cut to form new cutting edges. For example, at full speed the grinding wheels 81 and 81A are driven at 6000 r.p.m. At the slow or idle speed they are driven at speeds between 250 to 500 r.p.m. All power to the grinding wheels can be terminated.

In a bread slicing machine it is only necessary to form new cutting edges. A heavy grinding action on the bands about every six hours of operation. To touch up the bands, it is found that the sharpness of the bands can be maintained by polishing and lightly grinding the cutting edges about every two hours. The timer 144 is set to automatically energize the controls 141 and 142 at two hour intervals whereby the sharpening apparatus will automatically energize the controls 141 and 142 at two hour intervals whereby the sharpening apparatus will automatically function to touch up the cutting edges of the bands. To increase the grinding action on the cutting edges of the bands, the operator would merely readjust the control knobs on the controls 141 and 142 for a single grinding cycle.

In terms of method of sharpening moving endless bands of a bread slicing machine the grinding wheels 81 and 81A are rotated about upright axes generally normal to the plane of movement of the bands 29. Simultaneously with rotation of the grinding wheels they are moved transversely of the bands in sequential opposite lateral directions across the cutting edges of the bands. The grinding wheels are first transversely moved at least once, preferably a plurality, of periodic times at a slow rate of speed whereby the rotating wheels at a rate of about 2500 r.p.m., currently light grind and hone the cutting edges of the bands. After a period of use, new cutting edges must be put on the bands. This is done by transversely moving the grinding wheels at a high rate of speed of rotation, for example 6000 r.p.m., across the cutting edges. During normal use a new cutting edge is placed on the bands after about six hours of operation. The intervals can be varied as needed to maintain effective and efficient cutting.

The invention has been described with reference to a preferred embodiment. It is to be understood that various modifications and variations in the details of the invention may be made without departing from the spirit of the invention. The invention is defined in the following claims.

2. The embodiment in which an exclusive property or privilege is claimed are defined as follows:

1. An apparatus for sharpening a cutting edge of an elongated cutting member moving in the direction of the cutting edge comprising: a support having movable means extended transversely of the cutting member, a sharpening unit mounted on the movable means for movement transversely of the cutting member, said unit having grinding wheel rotatably mounted for rotation about an axis generally normal to the direction of movement of the cutting edge whereby an outer peripheral portion of the wheel engages the cutting edge and a motor for rotating the grinding wheel, said rotating wheel on movement of the movable means relative to the mounting member movable with the sharpening unit across the moving cutting edge of the elongated cutting member, control means for varying the speed of said motor whereby the speed of rotation of the grinding wheel can be changed, and cutting said movable means extended transversely moving said sharpening unit whereby the rotating outer peripheral portion of the wheel engages and moves transversely across the cutting edge.

2. The apparatus defined in claim 1 wherein said motor is an electric motor and said control means is an electric control unit operable to vary the speed of the motor without losses in motor torque.

3. The apparatus of claim 2 including a timer for automatically closing the circuit to the motor control whereby the grinding apparatus automatically sharpens the cutting member at selected time intervals.

4. An apparatus for sharpening a plurality of knife bands trained around a pair of spaced rotating drums and twisted into a parallel relationship, each band having a cutting edge, a top run and a bottom run comprising: a support having a first movable means extended transversely of the top run of the bands and a second movable means extended transversely across the bottom runs of the bands, said second movable means located between the top and bottom runs, first sharpening unit mounted on the first movable means for movement transversely of the bands, a second sharpening unit mounted on the second movable means for movement transversely across the cutting edges of the bands, each of said sharpening units having a means supporting the sharpening unit on the associated movable means, a grinding wheel rotatably mounted for rotation about an axis generally normal to the direction of movement of the cutting edge whereby an outer peripheral portion of the grinding wheel engages the cutting edge, and a motor for rotating the wheel, said rotating wheel on movement of the movable means relative to the associated mounting member movable with the sharpening unit sequentially across the cutting edge of each band, control means for regulating the speed of rotation of the motors whereby the rotating wheels rotate at a r.p.m. whereby the rotating wheels rotate at a rate of about 2500 r.p.m., currently light grind and hone the cutting edges of the bands. After a period of use, new cutting edges must be put on the bands. This is done by transversely moving the grinding wheels at a high rate of speed of rotation, for example 6000 r.p.m., across the cutting edges. During normal use a new cutting edge is placed on the bands after about six hours of operation. The intervals can be varied as needed to maintain effective and efficient cutting.

5. The apparatus of claim 4 wherein the control means comprises a first control for regulating the speed of one
motor and a second control for regulating the speed of the second motor.

6. The apparatus of claim 4 including a timer for automatically connecting the control to a source of power whereby the grinding motors are operated at selected intervals.

7. The apparatus of claim 5 wherein each control is operable to vary the speed of the associated motor without loss of motor torque.

8. The method of sharpening a moving endless band having a cutting edge comprising: rotating a grinding wheel about an axis generally normal to the plane of movement of the band, at least once moving the rotating grinding wheel transversely of the band with the grinding wheel rotating at a slow rate of speed to concurrently light grind and hone the cutting edge and then at least once moving the rotating grinding wheel transversely of the band with the grinding wheel rotating at a high rate of speed to grind the cutting edge.

9. The method of claim 8 including moving the grinding wheel transversely of a plurality of bands first at a slow speed of rotation and then at a high speed of rotation.

10. The method of claim 8 wherein the grinding wheel is moved transversely across the cutting edge of the band in a forward direction and then a reverse direction.

11. The method of claim 8 wherein the grinding wheel is moved a plurality of periodic times transversely of the band at a slow rate of speed of rotation and then at a periodic time moved transversely of the band at a high rate of speed.

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