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Holt

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[45] **Feb. 4, 1975**

[54] **APPARATUS FOR GRINDING CONCRETE BITS OR THE LIKE**

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[52] **U.S. Cl.** ..... **51/124 R,** 51/127, 51/234, 51/322

[51] **Int. Cl.** **B24b 7/02**

[58] **Field of Search** ..... 51/124 R, 234, 285, 288, 51/121, 122, 219 R, 127, 322

[56] **References Cited**

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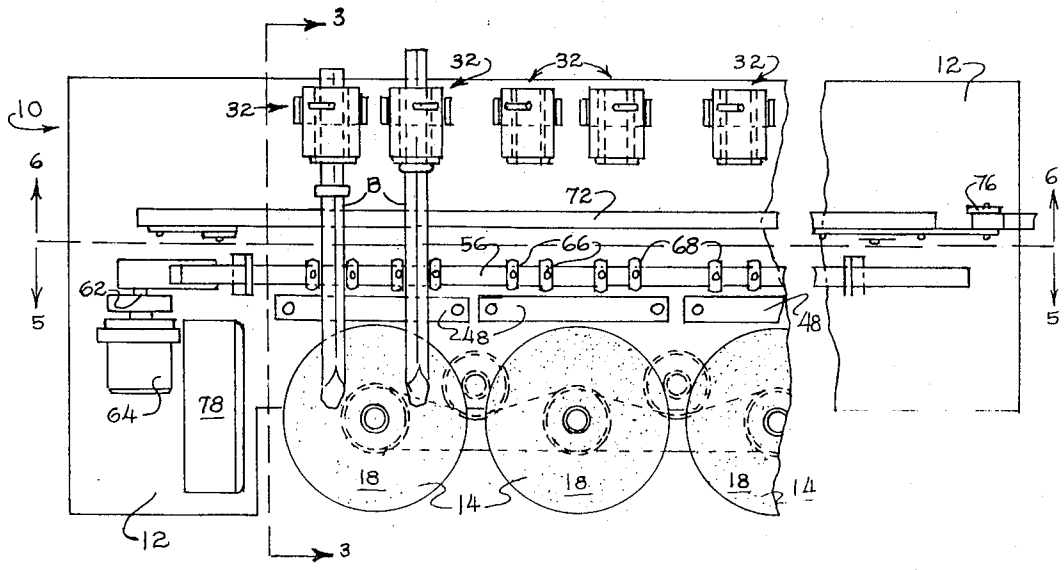
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[57] **ABSTRACT**

A plurality of concrete bits are simultaneously ground upon a radial face of each grinding wheel employed, while temperature-regulating movement is imparted to the bits. The grinding of each bit is automatically arrested, independently of the grinding of the remainder of the bits, when the desired re-shaping of a working face upon its forward end has been realized. The apparatus permits the reclamation of concrete bits in a highly satisfactory and economical manner, without the use of complex and expensive equipment or skilled personnel, and without adversely affecting the durability of the bits.

9 Claims, 7 Drawing Figures



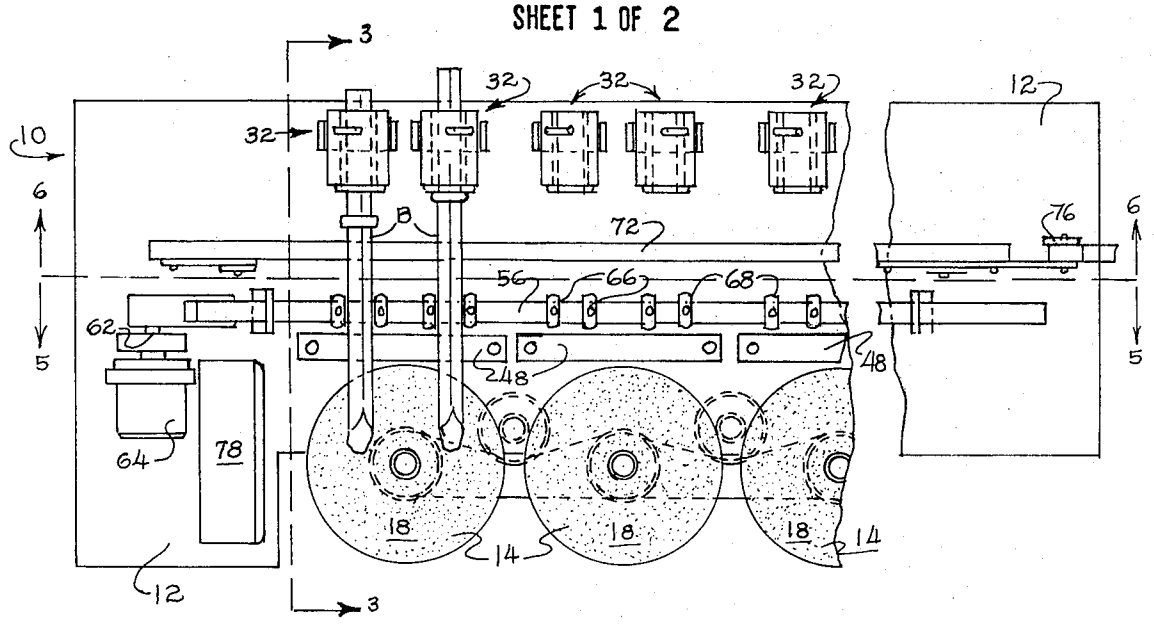


FIG. 1

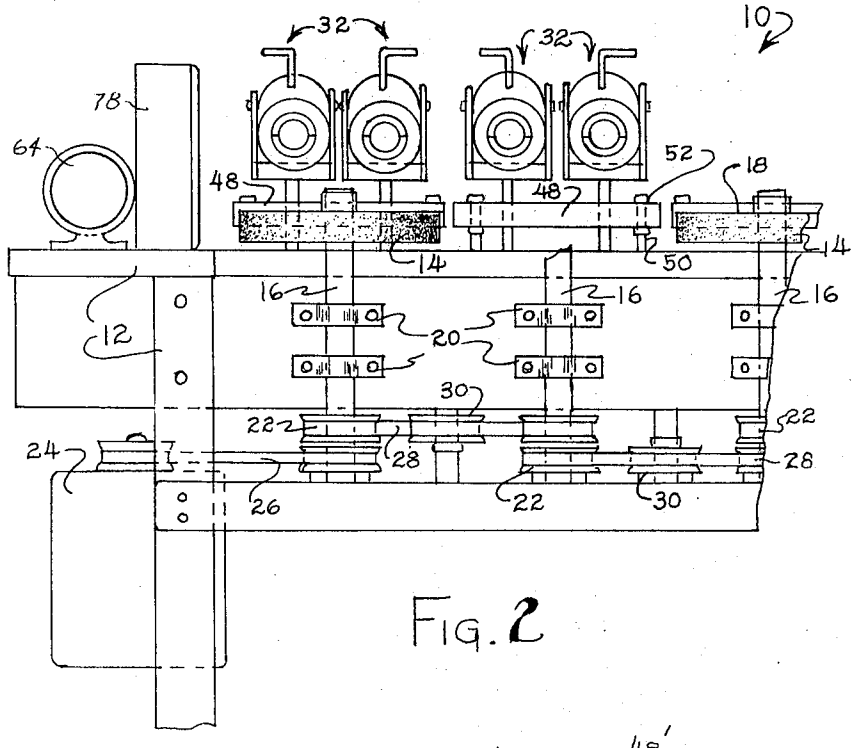


FIG. 2

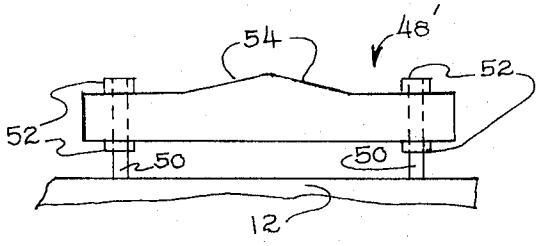


FIG. 7

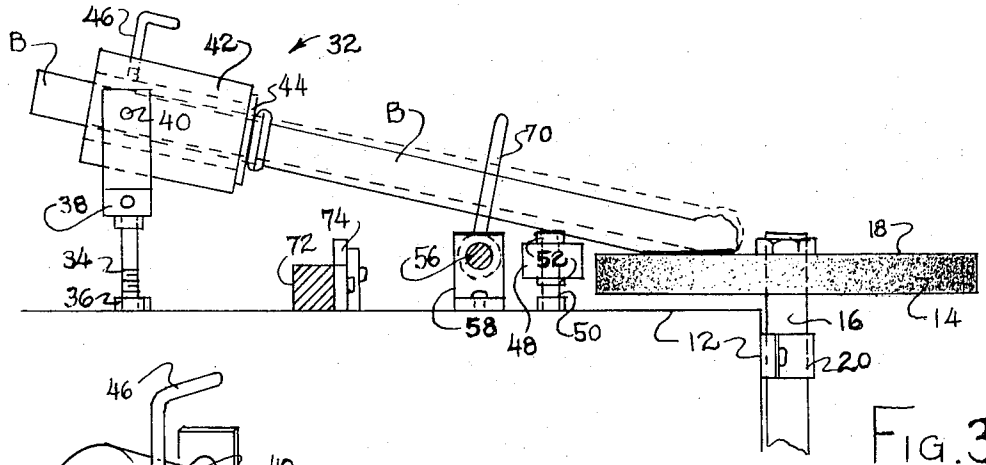


FIG. 3

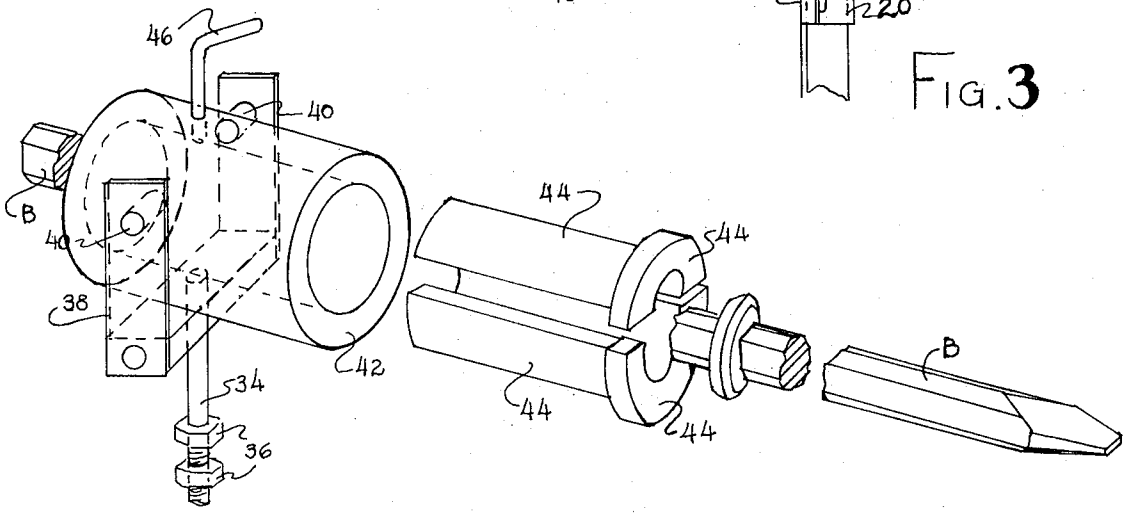


FIG. 4

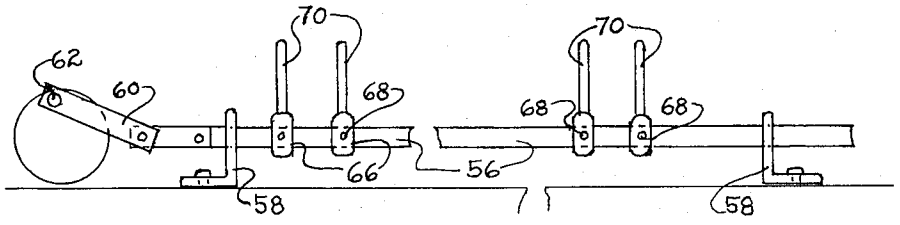


FIG. 5

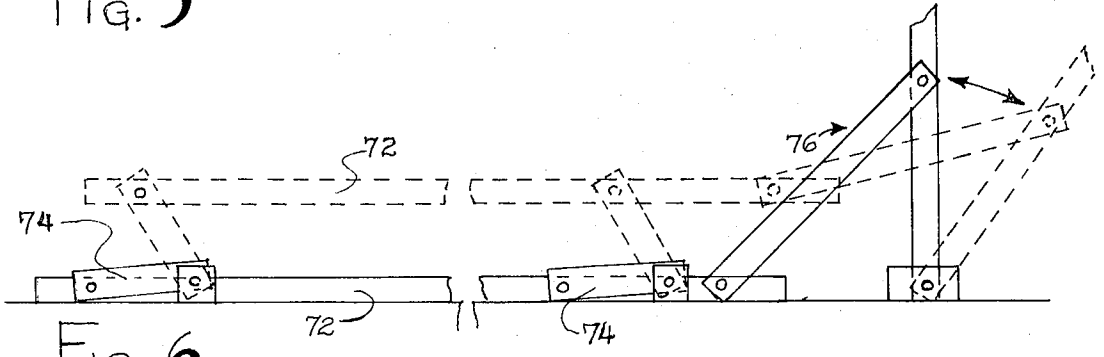


FIG. 6

APPARATUS FOR GRINDING CONCRETE BITS OR THE LIKE

BACKGROUND OF THE INVENTION

This invention relates to concrete bits such as are employed in pneumatic hammers and the like, and more specifically relates to a grinding apparatus for economically reclaiming concrete bits which have become worn in use.

Concrete bits are elongate and relatively massive steel implements, usually of hexagonal cross-sectional shape throughout most or at least the rear part of their lengths, employed in pneumatic hammers for breaking concrete and paving and the like. The rear end portion of each bit is adapted to be secured within an air hammer. The forward or "working" end of the bit is provided with a plurality of angularly extending cutting faces, the number of which will vary depending upon whether the bit in question is of the "chisel," "moil point" or some other type. During use of the bit, its forward end is maintained in engagement with the concrete while axialy directed blows are continuously applied, with great force and rapidity, to its rearward end portion by the air hammer.

Under the aforesaid conditions of their use, the forward ends of concrete bits naturally become worn, blunted, and unserviceable within a relatively short period of time, usually after only approximately 10 to 20 hours of operation. When this occurs, the bits must either be discarded or, as is preferable, reclaimed by suitable re-shaping of their deformed forward ends. Reshaping of worn bits has heretofore most frequently been done by metal-forging techniques. This is not entirely satisfactory, however. Firstly, metal-forging personnel and equipment are usually not possessed by paving contractors or similar volume-users of concrete bits, and frequently are not even available in the general locales of their operations. The relatively massive bits must therefore be shipped between the locale of their use and some remote place where such equipment and personnel are available, which entails considerable expense and which also requires that the bits be nonproductive for extended periods of time. Secondly, the temper of the bits is all too frequently changed by the forging operation. A change in temper may result in the re-shaped bits being too soft, in which event they wear excessively rapidly when restored to service, or being excessively hard and brittle, in which event they tend to break when restored to service. In either event, the durability of the bits is adversely affected.

Reclamation of concrete bits or of similar implements by grinding, rather than by metal forging, has also been proposed: see e.g., U.S. Pat. Nos. 2,316,904 and 3,739,529. But grinding has also heretofore been a less than entirely satisfactory way of reclaiming worn concrete bits. If requiring the use of sophisticated grinding machines or skilled personnel not normally maintained by or locally available to a paving contractor or similar user of concrete bits, the delay and expense of shipping the bits to and from a location possessing such facilities are still incurred. Manual grinding of the bits in a conventional manner, one at a time upon the circumferential face of a grinding wheel, is inefficient and uneconomical. Additionally, an unskilled person performing such a grinding operation can easily overheat the bits and thus adversely change their temper.

In summary, there has not previously been any way for a paving contractor or similar individual to efficiently and economically reclaim worn concrete bits, without the use of complex equipment or skilled personnel, and with the assurance that the original temper and durability of the bits would be retained.

SUMMARY OF THE INVENTION

The present invention provides an improved grinding apparatus by which badly worn concrete bits can be economically and efficiently reclaimed by paving contractors and the like without the use of complex or expensive equipment or skilled personnel, and without adversely affecting the temper and durability of the bits. In a preferred embodiment of the invention, there are provided a plurality of commonly driven grinding wheels each having a substantially flat upper radial face. A plurality of used concrete bits are pivotally mounted adjacent their rear end portions in association with each grinding wheel such that their worn forward ends overlie the radial face of such wheel. At the outset of a grinding operation, all of the bits are preferably pivoted upwardly out of engagement with the grinding wheels while the latter are brought to their desired rotational speed. Then the bits are allowed to pivot downwardly, preferably under the impetus of only their own weight, such that their forward ends engage and are ground by the radial face of the particular grinding wheel which they overlie. To prevent overheating of the bits during grinding, lateral reciprocatory movement is imparted simultaneously to all of them, such that the forward end of each is traversed toward and away from the center of its associated grinding wheel. In accordance with an alternative embodiment of the invention, the bits may if desired also be cammed upwardly out of engagement with the grinding wheels during part of their aforesaid lateral movement. The grinding of each bit is automatically arrested, independently of and without interrupting the grinding of any of the other bits, when the desired working face has been reformed on its forward end.

The apparatus of the invention may be and, in its preferred form, is of extremely durable, reliable and inexpensive construction and, following mounting of the worn concrete bits therein and bringing of the grinding wheels to operational speed, performs the aforesaid functions automatically and without the need for operator attention or supervision. With the use of such apparatus and only the part-time attention of an unskilled operator, worn concrete bits can be economically and efficietnly reclaimed by a paving contractor or the like without fear of the temper and durability of the bits being adversely effected.

DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will be in part apparent and in part pointed out hereinafter in the following description of an illustrative embodiment thereof, which should be read in conjunction with the accompanying drawings, in which:

FIG. 1 is a top plan view of an apparatus constructed in accordance with and suitable for the practice of the invention, the apparatus being broken away intermediate its length and having two worn concrete bits, of differing lengths, mounted therein;

FIG. 2 is a fragmentary front elevational view of the apparatus of FIG. 1, the concrete bits not being shown;

FIG. 3 is an enlarged fragmentary view, partially in vertical section but primarily in side elevation, taken approximately along the line 3—3 of FIG. 1 and showing one of the concrete bits and the adjacent components of the apparatus;

FIG. 4 is an enlarged perspective exploded view of one of the bit-mounting assemblies of the apparatus, and of a fragmentarily shown concrete bit in a reclaimed condition;

FIG. 5 is an enlarged and forshortened rear elevational view of the components of the apparatus for imparting lateral movement to the concrete bits;

FIG. 6 is an enlarged and forshortened front elevational view, showing the components of the apparatus for pivoting the bits out of engagement with the grinding wheels while the wheels are brought to operating speed; and

FIG. 7 is a front elevational view of an alternative embodiment of one of the components which arrest grinding of the bits.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more specifically to the drawing, the grinding apparatus designated in its entirety in FIGS. 1 and 2 by the numeral 10 includes a table-like frame 12 and a plurality of grinding wheels 14 each having a center shaft 16 and an uppermost radial grinding face 18. Grinding wheels 14 are rotatively mounted upon and adjacent the front of frame 12, as by the bearings 20 shown in FIG. 2, with their axes of rotation extending substantially vertically and their faces 18 extending substantially horizontally in a common plane. Although only three wheels 14 are shown at the drawings, normally four or more would be provided. A double pulley 22 is fixedly secured to each grinding wheel shaft 16 adjacent its lower end. Mounted upon frame 12 adjacent one end thereof, and preferably as shown in a semi-shielded location beneath its uppermost surface, is a conventional electric motor 24 of the totally enclosed type. A suitable belt 26 inerconnects the output pulley of motor 24 and one groove of the double pulley 22 most closely adjacent such motor. A second belt 28 interconnects the aforesaid pulley 22 and the next adjacent pulley, and is engaged intermediate its length by a tensioning pulley 30 suitable mounted upon frame 12 intermediate such pulleys 22. Additional belts 28 and tension pulleys 30 are similarly provided between successive adjacent pairs of the pulleys 22 throughout the length of apparatus 10, such that upon energization of motor 24 (through suitable control means, not shown) rotative movement is imparted simultaneously to each grinding wheel 14 of apparatus 10.

The elongate concrete bits B shown in association with apparatus 10 in FIGS. 1, 3 and 4 are of conventional steel construction and each have rear and forward end portions separated by a collar extending about and formed integrally with the periphery of the bit. Each bit has a hexagonal cross-sectional shape throughout at least its rear portion, and its forward end, when not blunted by use as in the case of the bits shown in FIGS. 1–3, terminates in a plurality of axially inclined cutting faces (see FIG. 4). While the illustrated bits B are all of the "chisel" type having two cutting faces, it is to be understood that this is for purposes of illustration only and that some or all of the bits might instead be of the "moil point" or some other type.

Apparatus 10 includes means for pivotally mounting a plurality of worn bits B, illustratively two of them in association with each grinding wheel 14 of the apparatus, such that each bit B extends angularly downwardly and forwardly toward the associated grinding wheel 14 and its forward end overlies and is freely movable both vertically and laterally relative to face 18 of such wheel. The aforesaid mounting means comprises a plurality of identical mounting assemblies 32, one of which is most clearly shown in FIGS. 3 and 4. Each assembly 32 includes and is supported by a threaded center post which projects substantially vertically through one of a plurality of bores (not shown) provided in the rearward portion of the top of frame 12. A pair of clamping nuts 36 provided upon the lower end of post 34 rididly secure it to frame 12 while still permitting convenient adjustment of the elevation of the post when desired. A generally U-shaped bracket member 38 is suitably mounted upon the upper end of post 34 for free pivotal movement about its substantially vertical axis. Pivot pins 40 carried by bracket 38 mount an elongate tubular member 42 for the aforesaid movement with bracket 38 and also for free pivotal movement relative to bracket 38 about a substantial horizontal axis extending through pins 40 and passing diametrically through member 42 non-centrally of its length. Member 42 is adapted to telescopically receive, from either of its opposite ends, a split-collar member 44, which in turn is adapted to receive the rear end portion of a concrete bit B. Collar 44 and bit B are releasable secured within member 44 by an L-shaped bolt 46 extending through a threaded bore provided within member 42 and engageable at its inner end with the periphery of collar member 44. The use of split-collar member 44 enables assembly 32 to securely mount a concrete bit B in any desired radial position, notwithstanding the bit's non-circular cross-sectional shape. As is indicated by the two shown in FIG. 1, the bits 8 may differ in length. Bits B of varying length may be readily accommodated by assembly 32 by reason of the appreciable length of tubular member 42, and its being open at both ends so that a bit may project completely through it. In the case of an extremely long bit B, it may be desirable to reverse member 42 end-to-end. This can readily be done simply by rotating bracket 38 180° about the axis of post 34. If required to accommodate an extremely short bit B, an entire assembly 32 may be moved forwardly upon the upper surface of frame 12 of apparatus 10 simply by repositioning rod 34 in another and more forwardly disposed one of the plurality of bores (not shown) provided through the top of frame 12.

As is best shown in FIG. 1, the two assemblies 32 associated with each grinding wheel 14 are located on opposite sides of and equidistant from an imaginary vertical plane extending rearwardly from the projected axis of rotation of the wheel 14, each assembly 32 being approximately mid-way between such plane and a parallel plane extending tangentally of such wheel. The forward-rearward position of a bit B mounted by an assembly 32 is preferably such that its terminal forward end is closely adjacent another imaginary vertical plane extending approximately perpendicularly to the aforesaid planes through the axis of rotation of the wheel 14. Forward-rearward adjustment of a bit B is realizable simply by sliding the same axially through members 42,44 prior to tightening bolt 46. At the time apparatus 10 is initially readied for use, the heigth of each bit-

mounting assembly **32** is adjusted, by suitably varying the positions of the nuts **37** upon its threaded post **34**, so that the central axis of a bit B mounted by the assembly **32** will define with radial face **18** of the associated grinding wheel **14** an included angle equal to the angle which would exist between such bit axis and the cutting faces of the bit if it were new. This may be quickly and easily done, even by an unskilled person possessing no gauges or the like, by mounting within the assembly **32** an unused new or reclaimed bit B of the type in question, and then varying the elevation of assembly **32** as required until the one of the bit's cutting face engaging radial face **18** of the wheel **14** lies in substantially coplanar relationship therewith. Once the aforesaid adjustment has been made, the elevation of assembly **32** may be left unchanged for so long as bits B of the same type (i.e., "chisel," "moil point", etc.) are mounted therein.

Apparatus **10** further includes means for automatically arresting the grinding of each worn bit B, independently of the grinding of the other bits, when the desired reshaping of a cutting face upon its forward end has been completed. As shown in FIGS. **1–3** of the drawings, the aforesaid means comprises a plurality of identical bar-like abutment members **48** each mounted upon the top of frame **12**, as by means of threaded rods **50** and nuts **52** or other means permitting convenient adjustment of their heigth, immediately rearwardly of an associated one of the grinding wheels **14**. Each member **48** underlies the two bits B extending thereabove to the associated grinding wheel **14**. The heigth of each member **48** is suitably adjusted, at the time apparatus **10** is prepared for initial use, so that when a cutting face of the desired shape has been ground upon the forward end of either bit B, the undersurface of the vertically adjacent portion of such bit will then engage and be supported by the substantially flat upper surface of member **48**. In FIG. **7**, the numeral **48'** designates an alternative embodiment of the aforesaid member **48**. Member **48'** is identical to member **48** except that its upper surface is not flat throughout its entire length, but rather has two upwardly inclined cam surfaces **54** provided thereon throughout a portion, illustratively the center portion, of its length. If member **48'** is employed in lieu of member **48**, the initial adjustment of its elevation is such that the flat portions of its length engage the undersurfaces of the bits B associated therewith when the forward ends of such bits have been properly ground.

To prevent possibly overheating and thus adversely changing the temper of the bits B during grinding thereof, apparatus **10** further includes means for imparting temperature-regulating movement to the bits, the movement being such that the forward ends of the bits are traversed generally radially of the faces **18** of the grinding wheels **14** with which they are associated toward and away from the centers of such wheels. As shown in FIGS. **1**, **3** and **5**, such means includes an elongate rod-like member **56** extending substantially the entire length of the top of frame **12**, and secured thereto by suitable bearings **58** for axial reciprocatory movement, in spaced underlying relationship to all of the bits B projecting thereabove between their associated mounting assemblies **32** and grinding wheels **14**. Adjacent one of its ends member **56** is pivotally connected by a linkage **60** to an eccentric crank arm **62** driven by a fractional-horsepower electrical motor **64** also mounted atop frame **12**. The control circuitry (not shown) of motor **64** is preferably interconnected with that of grinding-wheel drive motor **24** so both motors may be simultaneously started and stopped by a single switch. Upon energization of motor **64**, it will be apparent that axial reciprocatory movement will be imparted to member **56** by crank arm **62** through linkage **60**. Encircling member **56** at spaced locations along its length are a plurality of collar-like members **66**, each of which is slidable longitudinally of member **56** for purposes of positional adjustment when desired, but is normally secured to such member as by a set-screw **68**. An upstanding pin element **70**, which is preferably formed of brass or similar material capable of shearing under unusual stress, is carried by each collar member **66** and extends upwardly therefrom to an elevation considerably above that of the segments of the bits B overlying rod member **56**. Collar members **66** are so spaced longitudinally of member **56** that each bit B is closely "straddled" on opposite sides by an associated pair of the pins **70**. By virtue of the aforesaid arrangement, it will be apparent that upon axial reciprocatory movement of member **56**, pins **70** will engage bits B and pivot the same laterally, about the vertical pivot axes of mounting assemblies **32**, such that the forward ends of the bits will be moved generally radially of the faces **18** of their associated grinding wheels **14**, toward and away from the centers of such wheels. The throw of crank arm **62** is of course such that the forward ends of bits B are not moved so far toward the center of such wheels as to actually engage any of the center shafts **16** projecting above face **18** of the wheels, assuming the wheels are of a non-dished type presenting the latter obstacle.

In order to further increase its economy, durability and efficiency, apparatus **10** preferably further includes support means for, at the outset of the grinding operation and while wheels **14** are brought up to operating speed following energization of motor **24**, simultaneously pivoting all of the bits B upwardly out of engagement with wheels **14**. As shown in FIGS. **1**, **3** and **6**, such support means includes an elongate bar-like member **72** extending for substantially the entire length of the top of frame **12** in underlying relationship to bits B. Bar **72** is pivotally connected to frame **12** by linkages **74** for movement between a lowered inoperative position, illustrated in solid lines in FIGS. **1**, **3** and **6**, and an elevated operative position illustrated in phantom lines in FIG. **6**. For the purpose of imparting the aforesaid movement to bar **72**, lever assembly **76** is pivotally connected to one end thereof and to the top of frame **12**. In its lowered inoperative position, member **72** is disposed out of engagement with bits B. When, however, member **72** is moved to its elevated operative position by manual actuation of lever assembly **76**, it engages the undersurfaces of bits B and simultaneously pivots the same upwardly out of engagement with grinding wheels **14**. Upon return movement of member **72** to its inoperative position, bits B of course again pivot downwardly under the impetus of gravity until their forward ends again engage radial faces **18** of wheels **14**. It should be noted that even when bits B are pivoted upwardly by member **72**, the elevation of the bits is still not above that of the upper extremities of the previously-mentioned pin elements **70** straddling such bits.

The operation of apparatus **10** will now be described, with general reference to all of the various figures of the drawings.

At the outset of a grinding operation, an operator secures the rear end portion of a worn concrete bit B within each bit-mounting assembly **32** of apparatus **10,** in the manner previously described. Normally the apparatus would include at least eight assemblies **32,** for the simultaneous grinding of eight bits B, but the apparatus could of course include a greater or lesser number of assemblies. Not all of the bits B need be of the same type, since apparatus **10** is capable of simultaneously grinding a mixture of bits of, for example, the "chisel" type and the "moil point" type. Each bit B placed by the operator within as associated assembly **32** extends downwardly and forwardly therefrom, passing between a pair of the pins **70** extending upwardly from rod **56,** and its worn forward end rests upon the radial face **18** of the associated grinding wheel **14.**

The operator next swings lever assembly **76** in the appropriate direction to cause member **72** to simultaneously engage all of the bits B and pivot the same upwardly out of engagement with grinding wheels **14.** While the bits are out of engagement with wheels **14,** the operator energizes motor **24,** and preferably also motor **64,** and wheels **14** are brought by motor **24** and belts **26,28** to their full operational speed. When this has transpired, and it requires at most only a few seconds, the operator releases lever assembly **76** and allows bits B to pivot downwardly by gravity, at which time their forward ends engage faces **18** of wheels **14** and grinding commences.

Although it is not absolutely necessary in all instances that bits B be maintained out of engagement with wheels **14** while the latter are brought to operational speed, such procedure is desirable for several reasons. The worn forward end of one or more of the bits B might have on it a projection or the like which, if engaging the face **18** of a stationary wheel **14,** could upon energization of motor **24** either delay or altogether prevent the desired rotation of such wheel, or gouge its face **18.** Secondly, and even assuming that the bits are all free from such projections, maintaining them out of engagement with wheels **14** while the latter are brought to operational speed reduces the electrical power consumption at this time of motor **24,** and also enables the motor to be of a relatively small and economical size. In the latter connection, it has been found that a two horsepower motor **24** is quite sufficient for the adequate simultaneous grinding of eight worn bits B, and it is believed that such motor would be sufficient for the simultaneous grinding of at least twice that number of bits B.

During the grinding of bits B, each of them is pivoted laterally to and fro by the pins **70** which straddle it and which move in unison with reciprocating rod member **56** under the impetus of fractional-horsepower motor **64,** crank arm **62** and linkage **60.** This causes the forward end of each bit to travel generally radially of the grinding-wheel face **18** which it engages, toward and away from the center of such wheel. When the forward end of bit B is adjacent the center of its wheel **14,** less frictional heat is generated within the bit due to the linear speed of the wheel being less adjacent its center than adjacent its periphery. The aforesaid movement of the bits B therefore regulates their temperature and is adapted to prevent the bits from undergoing a detrimental change in temper due to overheating. It has been found satisfactory, in the operation of one apparatus constructed in accordance with the invention, for the lateral movement to be continuously imparted to the bits B at a rate of approximately 1.5 strokes per minute. Obviously, however, this might be changed if desired or required to achieve the necessary temperature-regulating affect. Change might be necessary if, for example, the composition or rotational speed of grinding wheels **14** were for some reason modified, in which event the bits B could be traversed at a different rate and/or at a non-uniform one. In the latter connection, it will be apparent that by the addition of a simple timer (not shown) in association with the control circuitry of motor **64,** the bits B could be caused to "dwell" or remain stationary adjacent the centers of their respective grinding wheels **14,** for a desired period of time, during each radially inward traverse thereof.

As is indicated in FIGS. **1** and **2,** a fan or blower **78** may if desired be provided atop frame **12** adjacent one end thereof for directing an air flow longitudinally of apparatus **10.** If provided, such blower **78** will also assist somewhat in preventing overheating of bits B, and will also assist in maintaining the various components of the apparatus free from accumulations of the dust-like metallic, and/or abrasive particles generated by the grinding operation. Although possible, the use of liquid cooling fluid in association with apparatus **10** is not desired, since the pumps, reservoirs, filters and like components normally required for use of a liquid coolant would, if incorporated within apparatus **10,** greatly increase its cost and complexity and its maintenance requirements.

In addition to its primary temperature regulating function, it will be noted that the lateral movement imparted to bits B during grinding thereof also performs the incidental function of equalizing wearing of faces **18** of wheels **14,** and thus discourages the localized wearing of grooves and the like therein. If, however, a groove or other irregularity should be present in the face of **18** of a particular wheel **14,** and a bit B engaging such groove or projection should for that (or any other) reason be restrained in its lateral movement, the single brass pin **70** then attempting to impart movement to such bit would simply shear. No damage would occur to any major component of apparatus **10,** and grinding of the remainder of the bits B in a proper manner would continue without interruption.

Each bit B pivots further downwardly during grinding thereof under the impetus of its own weight and as permitted by the progressive removal of metal from its forward end. This is indicated in FIG. **3.** which shows in phantom lines the forward end of a bit at the elevation occupied at the outset of a grinding operation, and which showns in solid lines the lower position of the bit after partial grinding of a new cutting face upon its undersurface. When the new cutting face has been completely formed upon the undersurface of its forward end, bit B then engages the abutment member **48** beneath it. Following such engagement, member **48** arrests further downward pivotal movement and grinding of the bit B. Grinding of the remainder of the bits B within apparatus **10** continues without interruption until they too, in turn and usually at somewhat varying times, similarly engage the respective members **48** associated therewith, at which time or times their grinding is also automatically arrested. When grinding of the

last bit B has been completed, motors **24,64** may be allowed to continue in operation pending reappearance upon the scene of the operator, who in the meantime has been free to engage in other tasks, or a timer (not shown) may be incorporated in the control circuitry of motors **62,64** so as to automatically deenergize the same following the passage of a period of time sufficient for completion of the grinding of all bits B. When the operator does again make his appearance, which may be at any time suiting his convenience, motors **24,64** are deenergized by him if this has not previously been done automatically. He then loosens the bolt B associated with each bit-mounting assembly **32,** rotates about its axis the bit B within such assembly to the appropriate extent (180° in the case of a bit of the "chisel" type; 90° in the case of a bit of the "moil point" type), re-tightens bolt **46,** and then again initiates operation of apparatus **10** in the manner previously described. Following the formation of a second new cutting face upon their forward ends, the reclamation of bits B of the "chisel" type is completed and the same way be removed from apparatus **10** and other worn bits mounted in the assemblies **32** vacated thereby. The procedure is the same with respect to bits of the "moil point" type, except that of course the formation of four new cutting faces thereon is required for their complete reclamation.

If an abutment member **48'** of the type shown in FIG. **7** is utilized in apparatus **10,** in lieu of a member **48** of the type shown in FIGS. **1** and **2,** the operation of the apparatus is the same as previously described except that temperature-regulating vertical movement, as well as lateral movement, is imparted to bits B during the grinding thereof. Thus, a bit B underlaid by an abutment member **48'** will during its movement toward the center of the associated grinding wheel **14** engage and be cammed upwardly by one of the cam surfaces on member **48'**. Engagement and heat-generation between the forward end of the bit and the radial face **18** of the grinding wheel **14** will thus be completely interrupted, until such time as reversal of the direction of the lateral movement of the bit again brings it out of overlying relationship with cam surface **54** of member **48'**. It will of course be appreciated that the slope, length and location of cam surface **54** are subject to modification is desired.

It would also be possible to readily modify apparatus **10** to provide assemblies **32,** members **48,56,72,** and their related components, not only rearwardly of grinding wheels **14,** as shown in the drawings, but also forwardly thereof. Such a modification would of course permit the simultaneously grinding of four, rather than two, concrete bits B upon the radial face **18** of each grinding wheel **14** of apparatus **10.**

Since other modifications and alternative embodiments of the invention will be apparent to those skilled in the art, it is to be understood that the foregoing description of a specific embodiment was for purposes of illustration only, and that the scope of the invention should be constructed in accordance with the following claims.

That which is claimed is:

1. Apparatus for grinding elongate concrete bits having worn forward ends, comprising:

frame means;

at least one grinding wheel having a radial grinding face;

means on said frame mounting said wheel for rotation about a substantially vertical axis with said face thereof facing upwardly and extending generally horizontally;

means for imparting said rotation to said wheel during operation of the apparatus;

bit mounting means spaced laterally from said grinding wheel for pivotally mounting a plurality of concrete bits adjacent the rear end portions thereof in longitudinally fixed and forwardly and downwardly inclined relationship to said face of said grinding wheel, with the forward ends of said bits overlying said face for engagement therewith during a grinding operation, for free vertical movement of said forward ends of said bits relative to said grinding wheel face and for lateral movement of said forward ends of said bits generally radially of said grinding wheel face toward and away from its central axis;

and power-operated means engagable with said concrete bits intermediate said bit mounting means and said grinding wheel for simultaneously imparting, during operation of the apparatus, said lateral movement to said forward ends of said bits to regulate the temperature and prevent overheating thereof.

2. Apparatus as in claim **1,** and further including abutment means spaced from said bits during grinding thereof but engagable with each of said bits intermediate its length, upon completion of the grinding of said forward end thereof, for then arresting further downward pivotal movement of said bit toward said grinding wheel face and for thereby arresting further grinding of said forward end thereof.

3. Apparatus as in claim **1,** and further including support means carried by said frame and extending transversely of and in underlying relationship to said bits intermediate their length for movement between an elevated position wherein said support means substantially simultaneously engages all of said bits and supports the same out of engagement with said grinding wheel face and a lowered position wherein said support means is out of engagement with said concrete bits, and lever means operatively connected to said support means for moving the same between said positions thereof at the outset of a grinding operation.

4. Apparatus as in claim **1,** and further including cam means cooperable with said means for imparting lateral movement to said bits for periodically camming said bits, in response to said lateral movement thereof, out of engagement with said grinding wheel face to assist in regulating the temperature and preventing overheating of said bits.

5. Apparatus as in claim **1,** wherein said bit mounting means comprises a mounting assembly for each of said bits, each mounting assembly being supported by said frame rearwardly of said grinding wheel and including an elongate tubular member pivotable about generally vertically and horizontally extending axes and adapted to receive therein the rear end portion of one of said bits.

6. Apparatus as in claim **5,** wherein each said mounting assembly further includes a split-collar member within said tubular member between said tubular member and said rear end portion of said bit.

7. Apparatus for grinding elongate concrete bits having worn forward ends, comprising:

elongate frame means;

a plurality of grinding wheels each having an upper radial face, said wheels being mounted for rotation upon said frame means in longitudinally spaced relationship to each other with said faces thereof all lying in approximately the same plane;

means for rotating said wheels during operation of the apparatus;

means for pivotally mounting a plurality of concrete bits adjacent the rear end portions thereof in inclined relationship to said face of each of said grinding wheels, with the forward ends of said bits overlying said face of the associated one of said wheels for engagement therewith during a grinding operation;

means for automatically and simultaneously imparting temperature-regulating pivotal movement to all of said bits to prevent overheating during grinding of said forward ends thereof;

and means for automatically arresting grinding of each of said bits, independently and without interrupting grinding of the remainder of said bits, when said forward end thereof has been ground to a predetermined desired shape.

8. Apparatus as in claim **7**, and further including support means for simultaneously pivoting all of said bits out of engagement with said grinding wheels while said wheels are brought to operational speed at the outset of a grinding operation.

9. Apparatus for grinding elongate concrete bits having worn forward ends, comprising:

frame means;

at least one grinding wheel having a radial grinding face;

means on said frame mounting said wheel for rotation about a substantially vertical axis with said face thereof facing upwardly and extending generally horizontally;

means for imparting said rotation to said wheel during operation of the apparatus;

means for pivotally mounting a plurality of concrete bits adjacent the rear end portions thereof in forwardly and downwardly inclined relationship to said face of said grinding wheel, with the forward ends of said bits overlying said face for engagement therewith during a grinding operation, for free vertical movement of said forward ends of said bits relative to said grinding wheel face and for lateral movement of said forward ends of said bits generally radially of said grinding wheel face toward and away from its central axis;

and means for imparting, during operation of the apparatus, said lateral movement to said forward ends of said bits to regulate the temperature and prevent overheating thereof, said means including rod means extending in underlying spaced relationship to said bits intermediate their length and mounted by said frame for axial longitudinal reciprocatory movement, a plurality of pin elements carried by said rod means at spaced locations sides of each of said concrete bits for engagement with said bits during reciprocatory movement of said rod means, and drive means connected to said rod means for reciprocating said rod means during operation of the apparatus.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,863,396 Dated 4 February 1975

Inventor(s) Billie E. Holt

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 51, "efficietnly" should read -- efficiently --.
Column 3, line 46, "suitable" should read -- suitably --.
Column 4, line 30, "releasable" should read -- releasably --; line 38, "8" should read -- B --.
Column 9, line 22, "way" should read -- may --.
Column 12, line 27, after "locations" insert -- along its length and projecting upwardly therefrom on opposite --.

Signed and sealed this 15th day of April 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks