United States Patent

[11] 3,596,413

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[54] **ABRADING TOOL CHIP EXTRACTOR AND REMOVER**
7 Claims, 8 Drawing Figs.

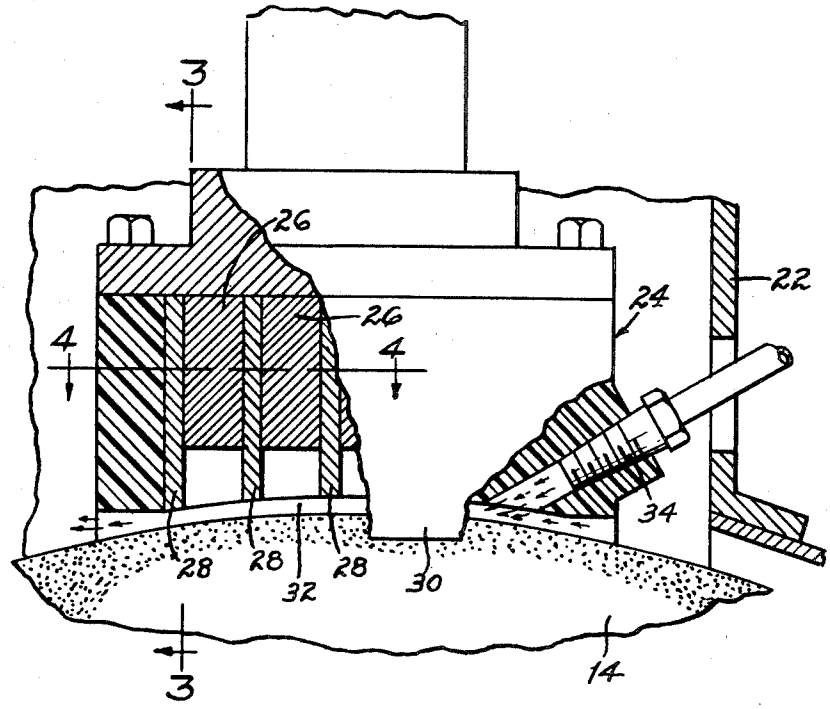
[52] **U.S. Cl.** ..... **51/262 A,** 51/268
[51] **Int. Cl.** **B24b 55/00,** B24b 55/04
[50] **Field of Search** ..... 51/262, 273, 262 A, 268

[56] **References Cited**
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ABSTRACT: A system for removing metal chips from a driven endless abrading tool to prolong the useful life of the tool. A magnet is provided to extract loosely clinging chips from the abrasive surface to remove the chips of the tool before the chips are ironed into such abrading tool by further abrading contact with a workpiece. A wind tunnel is provided and is in part formed by the magnet, and the abrasive surface of the tool, and an air stream passing through the tunnel exerts a force greater than the magnetically attractive force of the magnet to preclude the accumulation of chips on the magnet.



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SHEET 1 OF 2

FIG. 1

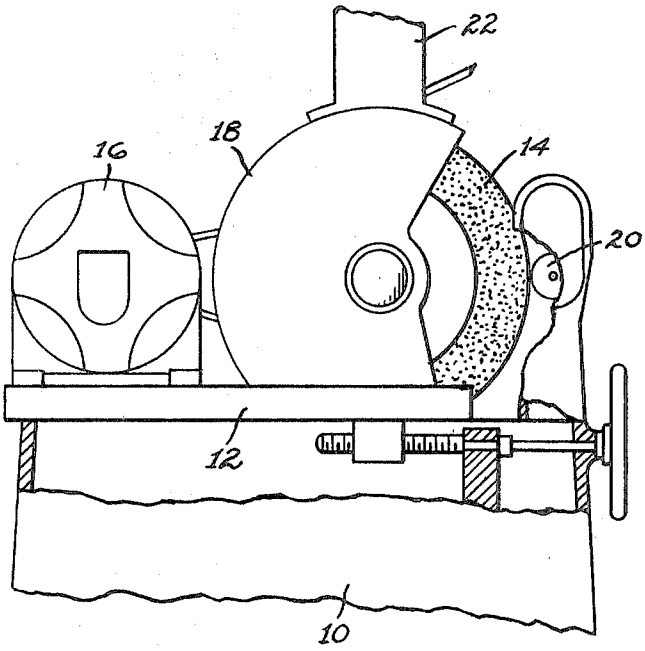


FIG. 3

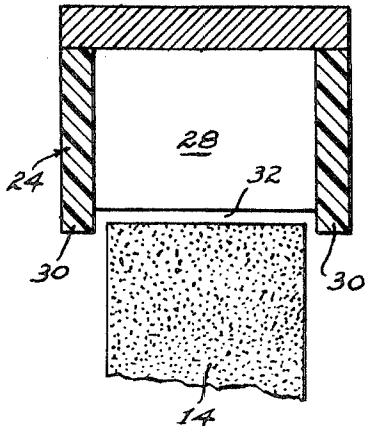


FIG. 4

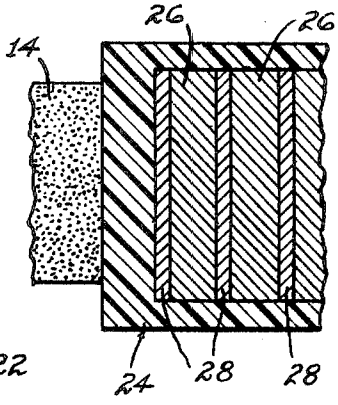
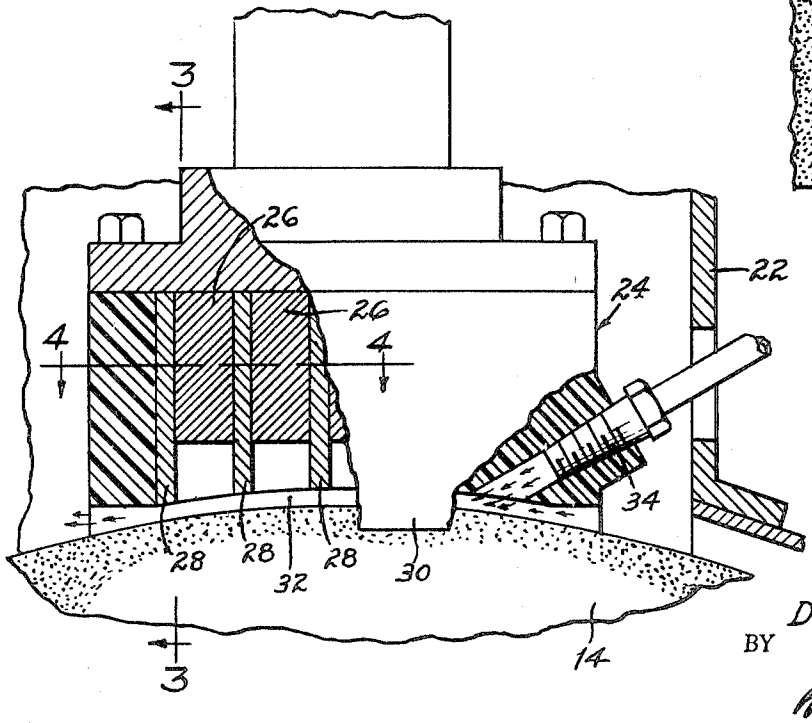


FIG. 2



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FIG. 5

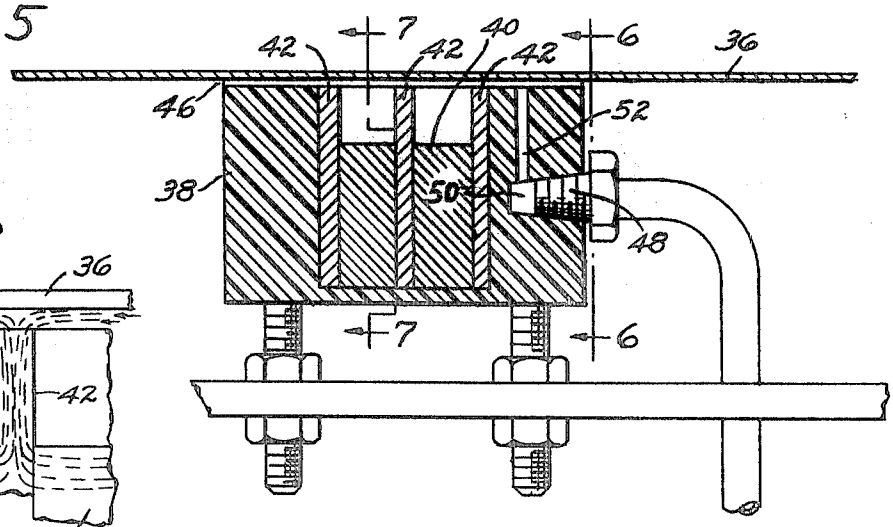


FIG. 8

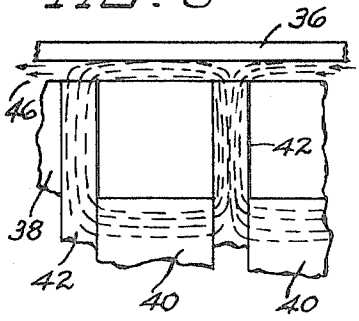


FIG. 6

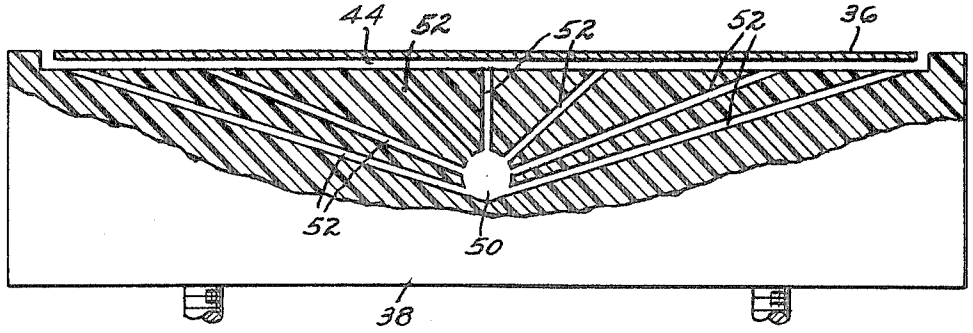
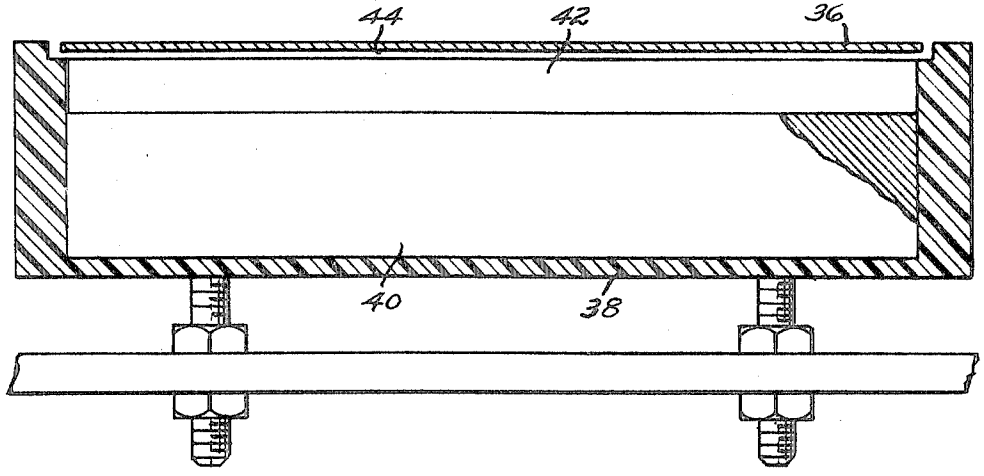


FIG. 7



ABRADING TOOL CHIP EXTRACTOR AND REMOVER

SUMMARY OF THE INVENTION

The invention resides in the provision for an abrading tool of a magnetic extractor to pull chips from the tool and a wind tunnel to exhaust the chips to atmosphere in opposition to the tendency of accumulation of chips on the magnet.

PRIOR ART

In the prior art, the provision of a magnet adjacent a grinding wheel is known. However, the function of the magnets have been to accumulate chips thrown off the wheel by centrifugal force so as to avoid littering the area around the machines. In one such known use, an electromagnet is used and it is deenergized periodically to release the accummulation of chips. In such machines, the chips would be ironed into the abrading tool during the interval when the electromagnet is deenergized, or the abrading machine would have to be shut down to remove the chips, either of which is objectionable.

It is an object of the present invention to provide a permanent magnet to extract loosely clinging chips from an abrading tool such as a grinding wheel or abrasive belt and to overcome the problem resulting from chip accumulation on the magnet by providing a wind tunnel wherein a fluid force is provided to overcome the magnetic attraction of the magnet for the chips.

Other objects of the invention will become apparent from the following description, taken in connection with the accompanying drawings in which:

FIG. 1 is a side view partly broken away and in section of a grinding machine embodying features of the present invention;

FIG. 2 is an enlarged fragmentary side view, partly broken away and in section;

FIG. 3 is a vertical sectional view, taken along the line 3–3 of FIG. 2;

FIG. 4 is a horizontal sectional view, taken along the line 4–4 of FIG. 2;

FIG. 5 is a vertical sectional view of another embodiment of the invention;

FIG. 6 is a vertical cross-sectional view, taken along the line 6–6 of FIG. 5;

FIG. 7 is another vertical cross-sectional view, taken along the line 7–7 of FIG. 5 and

FIG. 8 is an enlarged fragmentary view of the device of FIG. 5.

Referring first to FIGS. 1 to 4, the grinding machine shown comprises, in general, a base 10 supporting the usual movable table 12 on which is mounted a grinding wheel 14 and a motor 16. The grinding wheel 14 is mounted on the table 12 by a housing 18 which also functions as a safety guard. The table 12 is advanced to bring the wheel 14 against a metal workpiece 20 which is rotatably driven by a motor (not shown). For a more detail description of such machines reference may be had to my pending application, Ser. No. 545,363, filed Apr. 26, 1966 for Abrading Tool Control systems.

Mounted on the wheel guard 18, directly above the axis of rotation of the wheel 14 there is a mounting member and casing 22. Within the casing 22 there is a head 24 which is suspended over the periphery of the wheel 14, and preferably the underside of the head is of arcuate configuration to conform to the wheel periphery, as shown in FIG. 2. The head 24 is preferably made of epoxy and imbedded in the head there is a plurality of extractors, preferably permanent magnets 26 to attract and remove loosely clinging metal chips from the wheel 14. Preferably the magnets 26 are directionally magnetized ceramic magnets interposed between magnetic conducting pole pieces 28, such as soft iron. The lower edges of the pole pieces 28 are flush with the underside of the head 24, as shown in FIG. 2. A close clearance between the head 24 and the wheel 14 is achieved by lowering the head and allowing the wheel to grind the head to the desired clearance. The head 24 is wider than the wheel and consequently an arcuate

channel is formed in the head 24 having sides 30 which overlap the sides of the wheel 14. This restricts the air stream generated by the rotative action of the wheel 14 to a wind tunnel 32 wherein the force of the air stream generated is usually greater than the attractive force of the magnets 26 for the chips. As a consequence, the chips do not accumulate on and render the magnets ineffective, but instead the chips are exhausted from the wind tunnel to atmosphere. If desired the force of the air stream may be supplemented by an extraneous source of compressed air directed into the wind tunnel by a nozzle 34. However, such supplemental air force should not be necessary except possibly where a fine grain wheel is used and driven at a relative low speed.

Referring now to FIGS. 5 to 8, the numeral 36 designates the lower or return side of an endless abrasive belt to which metal chips resulting from an abrading or sanding operation tend to cling. Below the underside of the belt 36 there is a body or head 38 containing a pair of elongated magnets 40 having magnetic conducting pole pieces 42. Edges of the pole pieces 42 are exposed at the upper face of the head in close proximity to the abrasive surface of the belt 36 and together with the magnets 40 function to extract metal particles from the belt before such particles are ironed into the abrasive material against a workpiece. Preferably, the magnets 40 are ceramic magnets which are magnetized such that the magnetic force is in the direction of the thickness of the magnets or horizontally, as viewed in FIG. 8, for example. The magnets 40 are bar shaped and, together with the pole pieces 42, extend substantially across the entire width of the belt 36.

In order to assure that the magnetically extracted chips do not collect on the pole pieces 42, a wind tunnel 44 is provided between the underside of the belt 36 and an upper recessed face of the head 38. The head 38 may be recessed by moving the head up against the belt 36 until the desired clearance between belt and head is obtained. Air flow generated by the abrasive material of a high speed belt will be confined to the air tunnel and the force of the air stream will exceed the magnetic extraction force of magnets 40. Consequently, instead of the chips collecting on the pole pieces 42 and rendering them ineffective, the chips will be exhausted at the discharge end 46 of the wind tunnel.

In low speed abrading equipment and particularly where a fine abrasive belt is used, it may be desirable to supplement the force of the air stream from an extraneous source of pressurized fluid, such as compressed air. To this end, a nozzle 48 connected to a source of compressed air may be connected to a chamber 50 of the head 38 and from the chamber radial passages may extend to the recessed surface of the head as illustrated in FIG. 6.

What I claim is:

1. In abrading apparatus, a driven abrading tool to abrade chips from a workpiece of magnetic material wherein at least some of the chips cling to the abrading surface of the tool, at least one permanent magnet disposed proximate the abrading surface of said tool to extract chips therefrom magnetically, and a member overlying the abrading surface of said tool and cooperating therewith to define an restricting passage wherein an air stream generated by the operation of said tool exerts a force greater than the magnetic force of said magnet to deflect the chips from said magnet.

2. In abrading apparatus as defined by claim 1 wherein said magnet is mounted on said member and has pole pieces exposed to the air stream.

3. In abrading apparatus as defined by claim 1 wherein said member is a head having a channeled face receiving said tool.

4. In abrading apparatus as defined by claim 3 wherein said pole forms in part said tunnel.

5. In abrading apparatus as defined by claim 1, the addition of a source of pressurized fluid directed into said tunnel in the direction of the air stream generated by said tool.

6. In abrading apparatus as defined by claim 1 wherein said abrading tool is a sanding belt.

7. In abrading apparatus as defined by claim 1 wherein said abrading tool is a grinding wheel.