

[54] QUILL FOR MACHINE TOOLS

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[58] Field of Search51/168, 166.5; 76/DIG. 11; 77/58; 90/11 A, 11.1; 408/144

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[57] ABSTRACT

The invention discloses a quill arrangement for a machine tool in which the machine end of the quill is formed of steel and the tool end of the quill is formed of a cemented metal carbide having a high degree of stiffness relative to steel.

7 Claims, 2 Drawing Figures

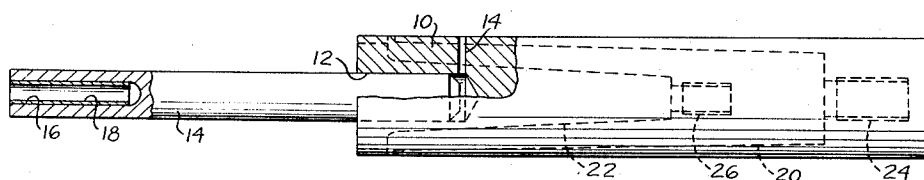


FIG-1

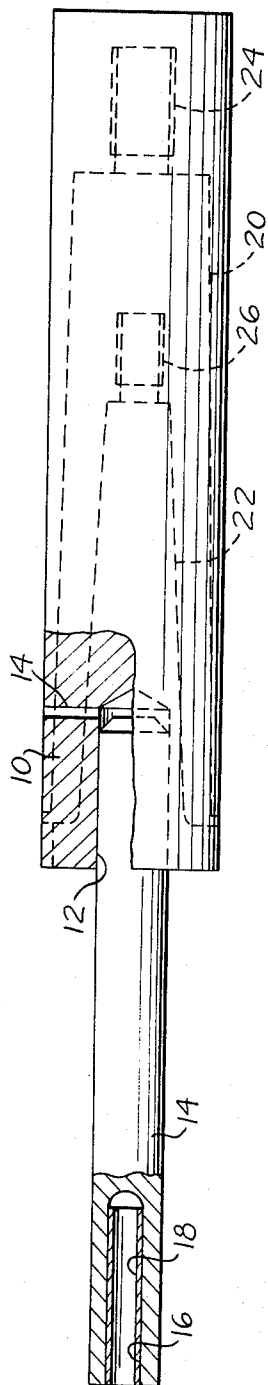
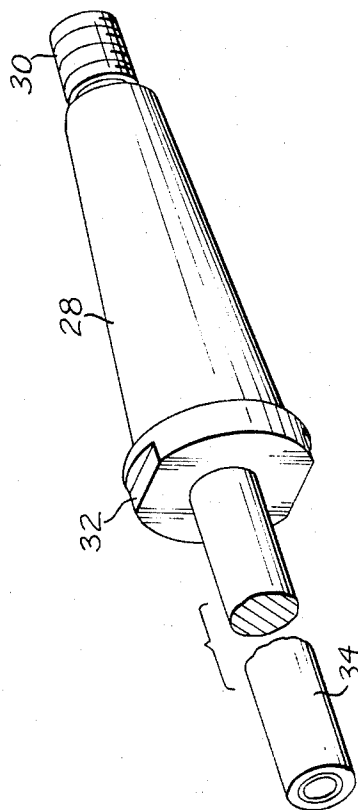


FIG-2



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QUILL FOR MACHINE TOOLS

This invention relates to machine tool quills, particularly to grinding machine quills, and is particularly concerned with a quill embodying a novel combination of two different materials.

Quills in machine tools, including grinding machines, are well known and are conventionally made from a solid piece of steel which is formed at one end for supporting a tool and at the other end for connection with the rotating spindle of the machine.

Such quills rarely have an overhang ratio of length to diameter greater than 5 to 1 because of the yieldability of the steel. When the ratio referred to becomes rather large, less stock can be taken at each pass across the workpiece and, with a grinding machine, there is a significantly longer time required to spark out at the end of a grinding operation. Furthermore, the steel of such a quill is under severe loading which can lead to fatigue of the material.

Having the foregoing in mind, the present invention proposes the construction of a quill of the nature referred to in which advantage is taken of the machinability of steel and of the high rigidity of a cemented metal carbide, particularly cemented tungsten carbide, in order to make quills which are stiffer and which can, therefore, be utilized for taking heavier cuts and which, at the same time, will permit a substantially greater overhang ratio than is possible when using steel alone.

In brief, the present invention proposes the provision of a ground cylindrical length of carbide with a bushing brazed in one end for connection of a tool, such as a grinding wheel, to the carbide and with the other end of the length of carbide secured to a length of steel, as by shrink fitting. This will form a blank which can be stocked as a shelf item and the steel then formed to order to fit in the spindle of the machine tool which is to use the quill.

The nature of the present invention will be more fully comprehended upon reference to the following detailed specification, taken in connection with the accompanying drawings, in which:

FIG. 1 is a side view, partly broken away, of a quill according to the present invention showing in dotted outline two of the options for machining of the steel portion of the quill; and

FIG. 2 is a perspective view showing a quill machined and ready for use in a machine tool.

Referring to the drawings somewhat more in detail, in FIG. 1, 10 indicates a round of steel of a certain length having an axial bore 12 in one end which is preferably vented as by vent hole 14 at the bottom. Into bore 12 is shrink fitted a length 14 of a cemented metal carbide, such as cemented tungsten carbide, which is ground to a substantially perfectly circular configuration. A bore 16 is formed in the outer end of the length carbide and in which is brazed a bushing 18.

The steel round 10 is adapted for being machined to various configurations for being fitted in a machine tool spindle as is indicated by dotted outlines 20 and 22, each of which shows a respective taper formed on the steel round with threaded cylindrical portions 24 and 26 at the extreme ends for securing the quills in place in the spindles.

It has been mentioned above that when quills are formed of solid steel, the ratio of the overhanging length of the quill to the diameter thereof is usually no greater than 5 to 1. By utilizing the carbide round in the steel portion as disclosed herein, however, ratios of up to 9 to 1 are quite practical and introduces no problems of deflection of the quill under load. Work can be more accurately machined and more rapidly machined than with conventional steel quills and, inasmuch as the quill is originally made with the steel part in the form of a length of round, it is possible to make a shelf item of the quill according to the present invention and machine the steel por-

tion to size for specific applications on order.

FIG. 2 shows a quill machined for installation into a machine and it will be seen that the steel is formed with a taper 28 and a threaded end portion 30 and a region 32 at the carbide end of the steel with wrench flats thereon and with a carbide portion 34 extending outwardly from the steel portion. It will be understood that in calculating the ratio of overhang to diameter of the quill according to the present invention, substantially all of the steel is contained within the spindle of the machine so that the length used in calculating the ratio is the length of carbide that projects from the steel and the diameter employed is the diameter of the carbide portion.

Carbide has substantially three times the stiffness of steel (Young's Modulus of Elasticity) and the ratio referred to can thus be increased substantially when carbide is used, as mentioned, up to 9 to 1 as opposed to a practical maximum of 5 to 1 for steel quills.

A feature of the present invention that is particularly advantageous is that, in using a quill according to the present invention as opposed to a solid carbide quill, as temperature developed in the tool, for example, a grinding wheel, and passes along the quill back to the holding taper, the steel taper and the steel part of the spindle adjacent the tapered end of the quill expand and contract at the same rate and the proper relationship of the steel part of the spindle of the machine to the quill is maintained.

With a complete carbide quill, not only must the quill be originally manufactured under great difficulty with the desired degree of taper to fit in the machine tool spindle, but a disadvantageous disparity of coefficients of thermal expansion exists between the taper on such an all carbide quill and the steel of the spindle of the machine in which it is mounted.

The shrink fitting of the carbide in the steel avoids stresses which can arise in a brazed joint between steel and carbide and still holds the carbide and steel firmly together.

Modifications can be made in the present invention within the scope of the appended claims.

We claim:

1. In a machine tool quill; a rod-like steel member adapted at one end of connection to a machine tool spindle for being driven in rotation thereby with the other end of said member exposed and projecting from the spindle, a central axial bore in said other end of said steel member on the axis of rotation of said member, and a round rod of cemented metal carbide substantially smaller in diameter than said steel member having one end extending a substantial distance into said bore in closely fitting relation thereto and fixed in said bore, said rod projecting axially from said other end of said member and coaxial with the axis of rotation thereof, said rod including means at its outer free end for supporting connection thereof to a metal working tool.

2. A machine tool quill according to claim 1 in which said cemented metal carbide is cemented tungsten carbide.

3. A machine tool quill according to claim 2 in which the ratio for the diameter of said rod to the length thereof projecting from said steel member is on the order of from about 1 to 7 to about 1 to 9.

4. A machine tool quill according to claim 3 in which said one end of said rod is shrink fitted in the said central axial bore in said steel member.

5. A machine tool quill according to claim 1 in which the said means at the outer free end of said rod includes a central axially extending recess in the rod.

6. A machine tool quill according to claim 5 which includes a bushing of machinable material fixedly secured in the said axially extending recess in said rod.

7. A machine tool quill according to claim 1 in which said steel member is cylindrical and of such a size as to permit machining thereof to fit various spindle tapers.

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