# United States Patent [19]

**Swisher**

[11] **3,848,931**

[45] **Nov. 19, 1974**


[54] **TOOL BIT FOR VIBRATION ATTENUATION**


[75] Inventor: **James A. Swisher**, Easton, Conn.

[73] Assignee: **International Tool Sales, Inc.**, Bridgeport, Conn.



[22] Filed: **Oct. 10, 1972**

[21] Appl. No.: **295,928**

[52] **U.S. Cl.**..... **299/94**, 173/139, 173/DIG. 2, 175/325, 279/19.7

[51] **Int. Cl.**..... **B25d 17/12**

[58] **Field of Search**... 299/37, 94; 173/139, DIG. 2; 175/56, 325, 408; 181/33 K, 33 L, 36 A; 279/19–19.7; 308/4 A



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,043,442 | 6/1936 | McNeil | 279/19 X |
| 2,997,024 | 8/1961 | McLean | 173/139 |
| 3,655,244 | 4/1972 | Swisher | 299/94 |
| 3,662,855 | 5/1972 | Adams et al. | 173/139 X |

FOREIGN PATENTS OR APPLICATIONS

| | | | |
|---|---|---|---|
| 22,436 | 9/1929 | Australia | 175/325 |



*Primary Examiner*—Ernest R. Purser

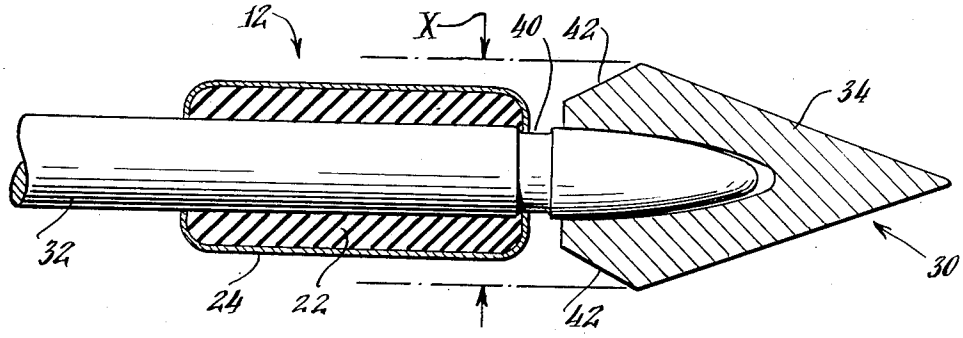
*Attorney, Agent, or Firm*—Wooster, Davis & Cifelli



[57] **ABSTRACT**

The vibrational characteristics of a percussion tool bit are varied by affixing a restraining collar thereto in accordance with the level of dampening desired. This collar is permanently affixed to the tool bit by incorporating a rigid interlock therebetween and a special compressible material is utilized therein to withstand high operating temperatures. Where the tool bit includes a detachable work tip, the tip is configured to serve as a protective shield for the collar upon penetration into materials. As part of this configuration, a conical surface is provided to facilitate withdrawal of the tool bit from penetrated materials and to avoid inadvertent removal of the tip during penetration.


**10 Claims, 4 Drawing Figures**



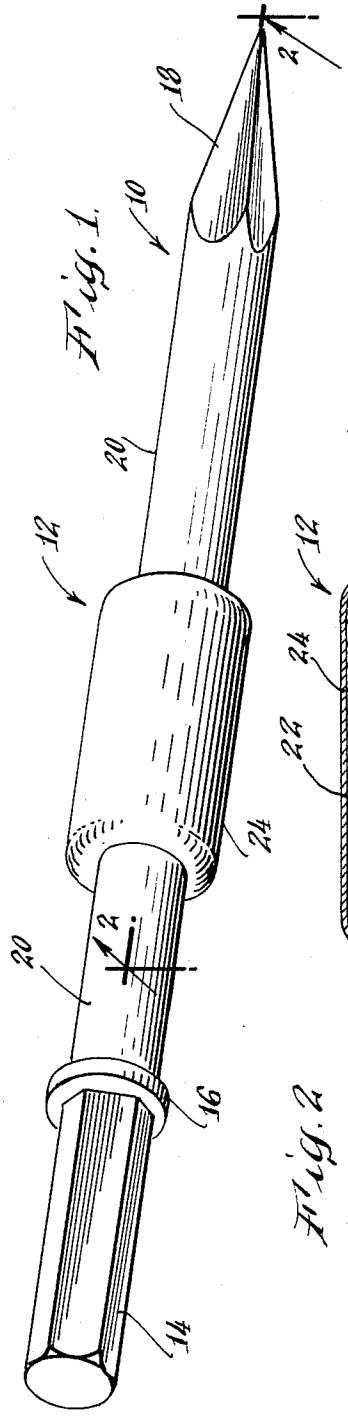


Fig. 1
10
18
20
12
24
2
16
14

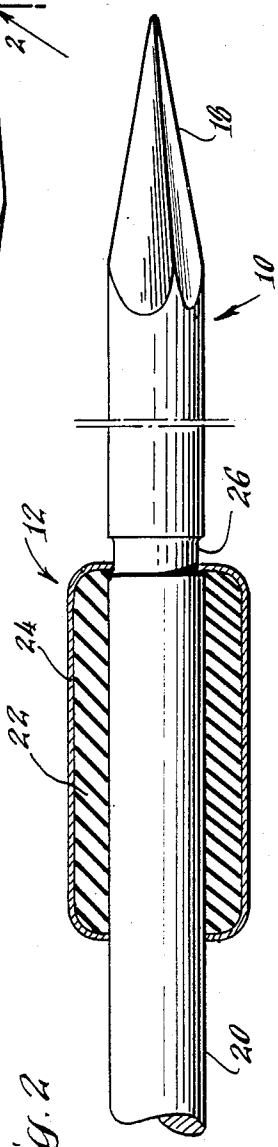


Fig. 2
10
18
26
12
24
22
20

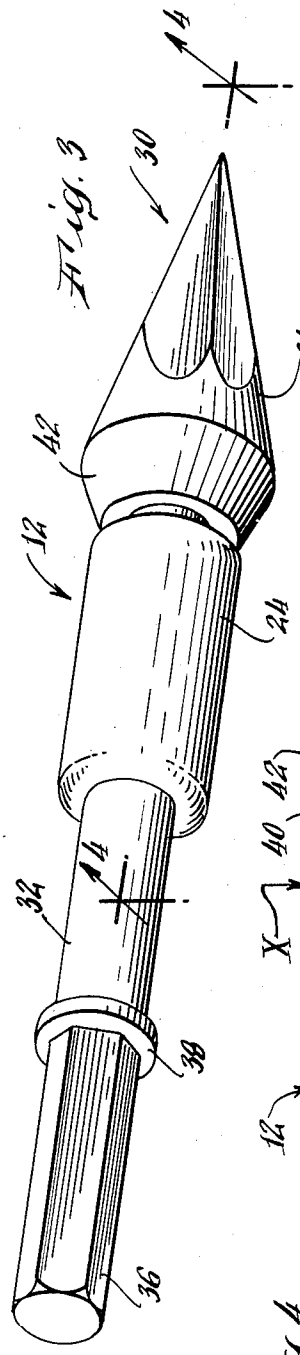


Fig. 3
30
4
34
42
12
24
32
4
38
36

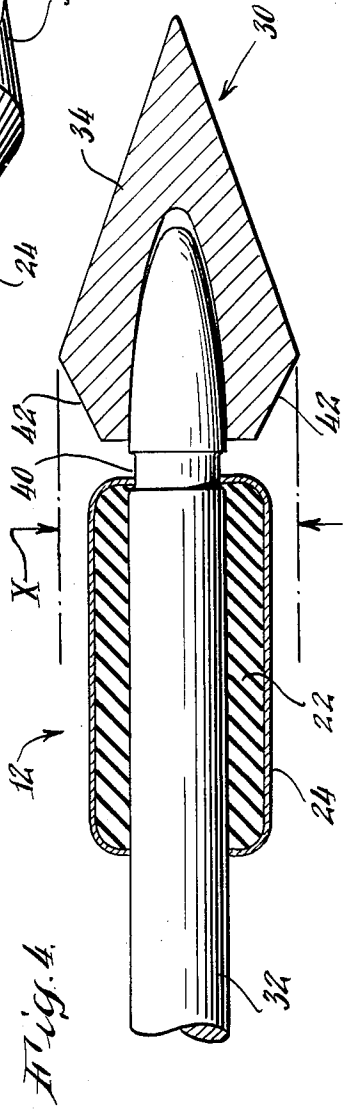


Fig. 4
30
34
42
42
40
X
12
22
24
32

# TOOL BIT FOR VIBRATION ATTENUATION

## BACKGROUND OF THE INVENTION

The present invention relates to the dampening of vibrations in percussion tool bits and especially to such dampening where the tool bits are utilized to penetrate into materials. Hitherto, many different approaches have been taken to attenuate the frequency response of tool bits in achieving either increased fatigue life or reduced noise generation. The most common approach utilized is to change the flexure characteristics of the tool bit so that it will only respond flexurally to very low frequency vibrations. A well known method of lowering the flexural response of a tool bit is to apply a dampening collar at some point thereon, however, many problems are encountered with the dampening collars presently known.

Most dampening collars have a greater outer diameter than the tool bit and where penetration operations are performed, they limit the depth of penetration attainable. Such collars are also subjected to much physical abuse when operating at the penetration limit. To minimize the penetration limit encounter, some collars are disposed immediately adjacent that portion of the tool bit which secures into the driving unit. However, a tool bit with such a collar is not interchangeably compatible for use with the holding provisions of all driving units. In this regard, the holding provisions most utilized to attain such compatibility is the conventional arrangement wherein a latch on the driving unit interlocks with an annular flange on the tool bit. However, this interlock is only effective over a small portion of the annular flange due to the presence of the collar in the arrangement and, therefore, undistributed wear and more limited tool life are encountered.

Some dampening collars are merely bonded to the tool bit and separate therefrom when the bond breaks under extremely abusive environments. This problem is further aggravated at the elevated temperatures encountered under some operating conditions or when the work tip of a single piece tool bit is reshaped. Furthermore, many dampening collars include compressible materials which encounter deleterious effects to their elastic properties at elevated temperatures.

## SUMMARY OF THE INVENTION

It is, therefore, a general object of the present invention to provide a tool bit having a dampening collar which minimizes and obviates the disadvantages of the prior art.

It is a specific object of the present invention to provide a tool bit having a dampening collar encased in a rigid sleeve which is engagingly interlocked to the tool bit.

It is a more specific object of the present invention to provide a tool bit having a dampening collar which is shielded from damage during penetration of materials and which does not limit the depth of penetration attainable by the tool bit.

It is another object of the present invention to provide a tool bit having a dampening collar and a detachable work tip compatibly configured to facilitate withdrawal of the tool bit from penetrated materials and to avoid inadvertent removal of the work tip during penetration.



It is a further object of the present invention to provide a tool bit having a dampening collar which includes compressible materials of high temperature endurance.

These objects are accomplished according to the present invention by structuring the dampening collar from a compressible sleeve disposed around a portion of the tool bit and compressively encasing the compressible sleeve in a rigid sleeve which engages into an annular groove on the tool bit. The compressible sleeve is fabricated of silicon based compounds to enhance the life expectancy of the collar where elevated temperatures are anticipated. When incorporated on a penetrating two-piece tool bit having a shank and a detachable work tip, the collar is shielded by the work tip. This shield is attained by configuring the work tip with a boring diameter of greater magnitude than the rigid sleeve and, therefore, the tool bit generates a clearance chamber for the collar upon penetration into materials. Hang up of the tool bit in penetrated materials is prevented by disposing a conical surface on the detachable work tip between its boring diameter and the collar.

## BRIEF DESCRIPTION OF THE DRAWING

The manner in which these and other objects of the invention are achieved will be best understood by reference to the following description, the appended claims, and the Figures of the attached drawing wherein:

FIG. **1** is a perspective view of a single piece tool bit to which the dampening collar of this invention is affixed;

FIG. **2** is a partial sectional view thereof, taken substantially along line **2—2** of FIG. **1** to illustrate the compressible and rigid sleeves of the dampening collar along with the groove by which the dampening collar is interlocked to the tool bit;

FIG. **3** is a perspective view of a two-piece tool bit to which the dampening collar of this invention is affixed; and

FIG. **4** is a partial sectional view thereof, taken substantially along line **4—4** of FIG. **3** to illustrate the compressible and rigid sleeves of the dampening collar, the groove by which the dampening collar is interlocked to the shank and the configuration of the work tip.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawing and, more particularly, to FIG. **1**, there is illustrated a single piece percussion tool bit **10** to which a dampening collar **12** in accordance with this invention is affixed. One end of the tool bit **10** includes a hexagonal portion **14** for insertion into the tool holding provisions of a driving unit (not shown). These holding provisions generally include a latch or a spring for interlocking to an annular flange **16** on the tool bit **10.** A work tip **18** is disposed at the other end of the tool bit **10** and is configured in accordance with the particular operation to be performed. The hexagonal portion **14** and the work tip **18** are interconnected by a shaft **20** through which percussion forces are translated from any suitable driving unit, such as a jack-hammer. Although the work tip **18** shown is configured to perform a penetration operation, such as breaking pavement or drilling rock, it could be configured to perform other operations, such as riveting or tamping.

The construction of the dampening collar **12** is illustrated in FIG. **2** where a compressible sleeve **22** is intimately disposed about a portion of the shaft **20** and a rigid sleeve **24** is disposed to compressibly encase the compressible sleeve **22.** An annular groove **26** is disposed around the shaft **20** and one end of the rigid sleeve **24** is configured to engage therein. Any material having suitable elastic properties may be used in fabricating the compressible sleeve **22,** however, ferrous oxide silicon based materials have been found to be particularly appropriate where high temperatures are encountered. The rigid sleeve **24** may be fabricated from any suitable material such as metal and the forming of the rigid sleeve **24** into the annular groove **26** may be accomplished by any suitable process, such as crimping.

In operation, the tool bit **10** will vibrate along its longitudinal axis, when percussion forces are applied thereto from the driving unit. The frequency of this vibration is directly related to the flexural characteristics of the tool bit **10** and, therefore, can be attenuated by lowering the flexural response of the tool bit **10.** By restraining flexural freedom around a segment of the tool bit **10,** the dampening collar **12** serves to lower the flexural response thereof. This is so because the compressible sleeve **22** is forced to bear against the tool bit **10** by the rigid sleeve **24** and, therefore, must vibrate at the same frequency as the tool bit **10** or dampening will occur. Since the compressible sleeve **22** has a very low flexural response, it will not follow any high frequency vibrations propagated through the tool bit **10,** so that such vibrations are dampened thereby. Therefore, the dampening collar **12** has the effect of lowering the flexural response of the tool bit **10.**

The dampening effect achieved by the dampening collar **12** depends on numerous factors and many combinations of these factors can be utilized to accomplish the particular dampening effect desired. Therefore, it would only confuse the matter to discuss any particular combination. Once a combination is determined however, the dampening collar **12** is of maximum effectiveness only so long as it remains affixed to the tool bit **10** at a precise location and the elastic properties of the compressible sleeve **22** do not deteriorate. Permanent affixment of the dampening collar **12** on the tool bit **10** is assured by the engagement of the rigid sleeve **24** into the annular groove **26** which creates an interlock therebetween. The primary cause of elastic deterioration in the dampening collar **12** is elevated temperatures and, therefore, ferrous oxide silicon based materials which present stable elastic properties at very high temperatures are used for the compressible sleeve **22.**

As illustrated in FIG. **3,** the dampening collar **12** of this invention can be applied to a two piece percussion tool bit **30** having a shank **32** and a detachable work tip **34.** At one end, the shank **32** includes both a hexagonal portion **36** for insertion into the tool holding provisions of the driving unit (not shown) and an annular flange **38** for interlocking therewith. The other end of the shank **32** is specially contoured to retain the detachable work tip **34** through an interference fit therewith. Again, the exterior of the detachable work tip **34** is configured to perform a penetration operation, however, it could be configured to perform many other operations, such as tamping or riveting.

Construction of the dampening collar **12** on the two-piece tool bit **30** is essentially identical to that described previously for the single piece tool bit **10.** This construction is illustrated in FIG. **4** where the identical reference numerals are used to designate the dampening collar **12** and its parts as were used in FIG. **2.** The compressible sleeve **22** is intimately disposed about a portion of the shank **32** with the rigid sleeve **24** disposed to compressibly encase the compressible sleeve **22.** An annular groove **40** is disposed around the shank **32** and one end of the rigid sleeve **24** is configured to engage therein. The detachable work tip **34** of the tool bit **30** is configured to have a boring diameter "X" of greater magnitude than the outer diameter of the rigid sleeve **24.** A conical surface **42** is disposed on the work tip **34** between the boring diameter "X" and the dampening collar **12,** with the taper of the conical surface **42** decreasing in the direction of the dampening collar **12.**

In use, the dampening collar **12** on the shank **32** lowers the flexural response of the two-piece tool bit **30** and maintains its maximum effectiveness in the exact same manner as was discussed previously for the single piece tool bit **10.** However, the boring diameter "X" of the detachable work tip **34** creates a clearance channel for the rigid sleeve **24** as the tool bit **30** penetrates into a material. Because of this clearance channel, the dampening collar **12** can follow the work tip **34** into penetrated materials without limiting the depth of penetration. Also, the dampening collar **12** is shielded from physical abuse due to the clearance provided. The conical surface **42** serves to reduce the stepped overhang of the detachable work tip **34** relative to the dampening collar **12** and, therefore, is effective in minimizing hang up between the work tip **34** and penetrated materials. As hang up is minimized, withdrawal of the tool bit **30** after penetration is facilitated and inadvertent removal of the detachable work tip **34** during penetration is avoided.

Although it is preferable to dispose the dampening collar **12** immediately adjacent the work tip **34,** as shown in FIG. **4,** the clearance channel and reduction in the stepped overhang will still be accomplished to some degree where these parts are separated by a significant distance. When the dampening collar **12** is disposed immediately adjacent the work tip **34,** however, the conical surface **42** may be tapered to a minimum periphery of no greater diameter than the outer diameter of the rigid sleeve **24** to eliminate the stepped overhang.

It should be readily appreciated by those skilled in this art that the dampening collar embodied by this invention may be applied to any percussion tool bit for lowering the flexural response thereof with maximum effectiveness. Also, where detachable work tips are utilized, a special configuration can be applied thereto for shielding the dampening collar from damage during penetration operations and eliminating the penetration limitation otherwise encountered. Furthermore, a conical surface can be included on the detachable work tip to avoid its inadvertent removal during penetration and to facilitate its withdrawal after penetration.

It should be understood that the present disclosure has been made only by way of example and that numerous changes in details of construction and the combinations or arrangements of parts may be resorted to without departing from the true spirit and the scope of the invention and, therefore, the present disclosure should be construed as illustrative rather than limiting.

What I claim is:

1. A percussion tool bit for attenuating operational vibrations, comprising:
   - a shank through which forces are translated, said shank having a groove disposed therein;
   - a compressible sleeve disposed about a portion of said shank and in intimate contact therewith;
   - a rigid sleeve disposed to compressibly encase said compressible sleeve, said rigid sleeve being configured for engagement into said groove on said shank to interlock therewith; and
   - a work tip detachably affixed to one end of said shank.

2. The tool bit of claim 1 wherein said compressible sleeve is fabricated of a ferrous oxide silicon base material.

3. The tool bit of claim 1 wherein said work tip is configured to perform penetrating operations and includes a boring diameter of greater magnitude than the outer diameter of said rigid sleeve, said boring diameter being effective to create a clearance channel for said rigid sleeve during penetration.

4. The tool bit of claim 1 wherein said work tip is configured to perform penetrating operations and includes a conical surface, said conical surface being oriented to present a decreasing taper in the direction of said rigid sleeve to reduce hang up of said work tip in penetrated materials.

5. The tool bit of claim 1 wherein said work tip is configured to perform penetrating operations and includes a conical surface and a boring diameter, said boring diameter being of greater magnitude than the outer diameter of said rigid sleeve to create a clearance channel for said rigid sleeve during penetration, said conical surface being oriented to present a decreasing taper from said boring diameter in the direction of said rigid sleeve to reduce hang up of said work tip in penetrated materials.

6. The tool bit of claim 5 wherein said compressible sleeve is fabricated of a ferrous oxide silicon base material.

7. The tool bit of claim 5 wherein said rigid sleeve is disposed immediately adjacent said work tip on said shank and said conical surface tapers to a minimum periphery of no greater diameter than the outer diameter of said rigid sleeve.

8. A vibration dampening collar for a percussion tool bit, comprising:
   - a compressible sleeve configured to fit about a portion of the tool bit in intimate contact therewith; and
   - a rigid sleeve disposed to encase said compressible sleeve, said rigid sleeve being configured to compress said compressible sleeve on the tool bit and having an interlocking portion thereon for engagement into a groove on the tool bit.

9. The vibration dampening collar of claim 8 wherein said compressible sleeve is fabricated of a ferrous oxide silicon base material.

10. A percussion tool bit for attenuating operational vibrations, comprising:
   - a shank through which forces are translated;
   - a compressible sleeve disposed about a portion of said shank and in intimate contact therewith;
   - a rigid sleeve disposed to compressibly encase said compressible sleeve; and
   - a work tip detachably affixed to one end of said shank, said work tip being configured to perform penetrating operations and including a boring diameter of greater magnitude than the outer diameter of said rigid sleeve, said boring diameter being effective to create a clearance channel for said rigid sleeve during penetration.

* * * * *