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TUBE DRAWING NIB MOUNT

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Fig. 1

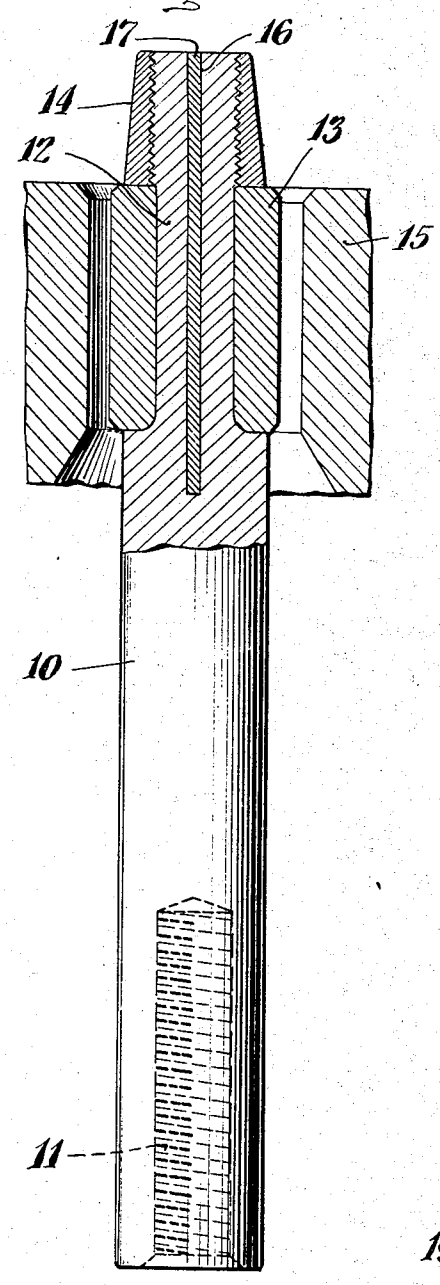


Fig. 2

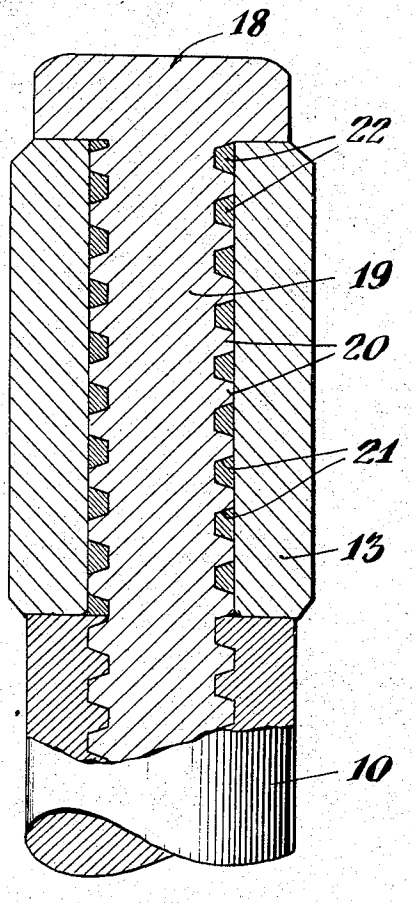
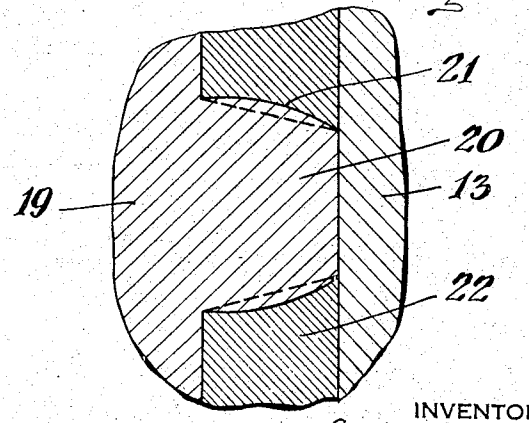


Fig. 3



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TUBE DRAWING NIB MOUNT

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13 Claims. (Cl. 205—7)

The present invention relates to tube drawing mandrels and, more particularly, to the means for mounting the nibs thereof. The nibs are formed from hard metallic materials, such as cemented hard metal carbides, having low tensile strength, great hardness, high compressive strength and resistance to abrasion, and low coefficient of thermal expansion. Examples of such materials are described and claimed in the Schroter Patent No. 1,549,615, issued August 11, 1925, which consist of minute particles of extremely hard tungsten carbide cemented together with a small amount of cobalt. Heretofore such a nib in the shape of a sleeve was secured to a steel shank by means of a steel stud extending through and snugly fitting within the nib sleeve. Difficulty was experienced in that during use the nib sleeve frequently was cracked or its surface was spalled, now believed to have been caused by the pressure exerted on the nib sleeve by the greater expansion of the stud when heat was developed during the drawing.

A general object of the present invention is the provision of efficient and simple means for permitting the nib sleeve-supporting stud to expand without exerting undue pressure on the nib sleeve.

More specific and further objects are the provision of a tube drawing mandrel, and a shank and nib sleeve-supporting stud, characterized by a recess or recesses in the nib sleeve support which effectively permits expansion of the latter without exerting undue pressure on the nib sleeve; to provide, if desired, in the recesses in the nib sleeve support a mass or masses of soft metallic material for cushioning such expansion; and the provision of structural embodiments of the device which are readily constructed and allow efficient use and operation thereof.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a side elevational view with parts broken away and in section of a mandrel of the present invention associated with a suitable drawing die;

Fig. 2 is an enlarged side elevational view with parts broken away and in section of a modified structure of the mandrel of the present invention; and

Fig. 3 is a greatly enlarged detailed view in section of a portion of the nib and the support shown in Fig. 2, showing the probable operation thereof during use in permitting expansion of the support without exerting undue pressure on the nib.

Prior to the present invention it was usual to provide a snug fit between the nib sleeve and its supporting stud to provide mechanical support for the nib in an effort to avoid breakage thereof by vibration or compression. It is now believed that the stud need not provide any particular degree of mechanical support so long as the nib is sufficiently strong to withstand the working forces, the stud merely holding the nib in position. By providing means to prevent expansion of the stud from exerting undue pressure on the surrounding nib, the material of which has a much lower coefficient of thermal expansion than the stud material, it has been found that spalling of the surface of the latter and breakage is largely eliminated.

With the elimination of the apparently unnecessary requirement of a high degree of mechanical support for the nib by the stud it is now possible to use a more elastic and tougher metallic material for the shank and stud and the use of shanks and studs of smaller diameters than heretofore used with nibs of given diameters. This has been found to permit use of stronger nibs and largely to eliminate breakage of shanks and studs. Highly elastic steel of great strength, such as S. A. E. 3250 having a Rockwell C hardness of from about 40 to 50 has been found to be desirable material for shanks and studs. A suitable material for the nib may be cemented tungsten carbide containing about 6% to 16% cobalt. It is to be understood, however, that the invention is not limited to the use of these specific materials.

In the drawing are shown mandrels of the present invention which are suitable for use in drawing tubes. The steel mandrel shank 10 is secured to a supporting rod (not shown) in any suitable way such as by the threaded socket 11 shown in dotted lines. The other end of the mandrel shank 10 is reduced in diameter to form a stud 12 on which is seated a nib sleeve 13 held in position by a collar 14 threaded upon

the outer end of the stud as shown. A suitable drawing die 15 surrounds the nib 13 which is preferably slightly tapered. A tube to be reduced in diameter is drawn toward the free end of the mandrel between the drawing die 15 and the nib 13. Similar devices may be used to smooth out excess weld materials on the outer and/or inner surfaces of welded tubes, or for changing the diameter of the tube passage or thickness of the wall or both.

In accordance with the present invention expansion of the stud 12 due to heat developed during the drawing of the tubes may be prevented from exerting undue pressure on the nib by splitting the stud 12 longitudinally with a milling cutter to provide a slot 16. The slot 16 preferably extends beyond the inner end of the seat for the nib sleeve provided by the stud 12 as shown. The slot 16 is preferably filled with a mass 17 of soft metallic material, such as, for example, copper, brass, bronze, solder or brazing material, which cushions the radial expansion of the stud 12. The stud 12 may additionally be provided, if desired, with a similar slot arranged at a radial angle of say 90° to the slot 16. Any number of such slots arranged as desired obviously may be used.

Any suitable means of providing a plurality of lands and intervening depressions in the nib sleeve-seating surface of the stud with, if desired, the depressions partly or wholly filled with soft metallic material, may be used as alternative cushioning means. For example, one or more longitudinally or transversely extending grooves or slots may be formed in the nib sleeve-seating surface of the stud, filled if desired with soft metallic material. The stud may be formed separately from the shank and secured thereto in any suitable manner. If the stud is formed separately from the shank, it can more readily be heat-treated to obtain desired physical properties, such as a high degree of elasticity. The end of the stud may be received and pinned or threaded into a socket in the end of the shank 10. In Fig. 2 such a structure is shown by way of example. The stud is provided with a head 18 and a shank 19 threaded throughout its entire length as shown. The threads 20—20, preferably having rounded or flattened tops, constitute elastically supporting or seating lands for the nib sleeve 13 and a groove or grooves 21—21 between the lands 20—20 adapted to lie beneath the nib sleeve may be filled with a mass or masses 22—22 of soft metallic material.

In accordance with the present invention the nib sleeve is held in position by a snugly fitting seat, chattering thereof is avoided, and the expansion of the steel supporting stud due to heat developed during tube drawing is prevented from exerting undue pressure upon the nib sleeve. For example, when a threaded stud such as that shown in Fig. 2, is used which has been properly heat-treated to develop a certain elasticity, the expansion of the steel against the inner surface of the nib will cause the sides of the threads 20—20 to distort or bulge into grooves 21—21, as shown in Fig. 3, without exceeding the elastic limit of the steel. If the grooves 21—21 are filled with masses 22—22 of soft metallic material these will cushion the expansion of the steel. Obviously the use of masses 22—22 of soft metallic material are not essential to the practice of the invention, the elastic steel itself cushioning the nib which is held snugly in position free from chattering by the lands provided by the threads 20—20, and the grooves 21—21 permitting distortion of the sides of the threads during expansion to relieve the nib sleeve from the enormous forces that may be developed by the expansion of a tightly fitting solid stud.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. Means for securing a hard metallic nib sleeve to the shank of a tube drawing mandrel, said means comprising a resilient metallic stud having a recess therein to permit radial expansion without exerting undue pressure on the nib.

2. Means for securing a hard metallic nib sleeve to the shank of a tube drawing mandrel, said means comprising a resilient metallic stud having a plurality of lands and intervening depressions on the nib sleeve-seating surface thereof to permit radial expansion without exerting undue pressure on the nib.

3. Means for securing a hard metallic nib sleeve having a smooth inner surface to the shank of a tube drawing mandrel, said means comprising a resilient metallic stud having the nib sleeve-seating surface thereof grooved to form elastically supporting lands, said grooved surface extending the full working length of said sleeve.

4. Means for securing a hard metallic nib sleeve to the shank of a tube drawing mandrel, said means comprising a resilient metallic stud having spirally arranged nib sleeve-seating lands and intervening grooves on the surface thereof, said lands and grooves extending the full working length of said sleeve.

5. Means for securing a hard metallic nib sleeve to the shank of a tube drawing mandrel, comprising a metallic stud having soft metallic material located in a recess therein to cushion radial expansion.

6. Means for securing a hard metallic nib sleeve to the shank of a tube drawing mandrel, comprising a metallic stud having a slot extending longitudinally thereof and soft metallic material located in the slot to cushion radial expansion.

7. Means for securing a hard metallic nib sleeve to the shank of a tube drawing mandrel, comprising a metallic stud having a plurality of lands and intervening depressions on the nib sleeve-seating surface thereof and soft metallic material in the depressions to cushion radial expansion.

8. Means for securing a hard metallic nib sleeve to the shank of a tube drawing mandrel, comprising a metallic stud having the shank thereof threaded and the grooves adapted to lie beneath the nib sleeve filled with soft metallic material to cushion radial expansion.

9. A mandrel shank having an end thereof reduced to form a nib sleeve supporting stud, said stud being split longitudinally to form a slot, and a mass of soft metallic material in the slot to cushion radial expansion.

10. A tube drawing mandrel comprising a metallic shank, a hard metallic nib sleeve, a metallic stud snugly fitting within said sleeve and mounted on an end of said shank to secure said nib sleeve coaxially to said shank, the material of said stud having a higher coefficient of thermal expansion than the material of said nib, and a mass of soft metallic material located in a recess in said stud to permit radial expansion thereof without exerting undue pressure on said nib.

11. A tube drawing mandrel comprising a steel shank, a cemented hard metal carbide nib sleeve, a steel stud snugly fitting within said nib sleeve and mounted on an end of said shank to secure said nib sleeve coaxially to said shank, said stud having a plurality of nib sleeve-seating lands and intervening depressions to permit radial expansion of the stud without exerting undue pressure on the nib.

12. A tube drawing mandrel comprising a shank and a resilient metal stud, a hard metallic nib sleeve fitted snugly onto said stud, said sleeve having a straight, cylindrical hole therethrough of uniform diameter and a smooth interior surface, means for securing said sleeve in position on said stud, and means permitting radial expansion of said stud without exerting undue pressure on said sleeve.

13. A tube drawing mandrel comprising a shank and a resilient metal stud, a hard metallic nib sleeve fitted snugly onto said stud, said sleeve having a smooth interior surface, means for securing said sleeve in position on said stud, and a recess in the portion of said stud within said sleeve, said recess permitting radial expansion of said stud without exerting undue pressure on said sleeve.

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