April 8, 1969 KIYOSHI HAJIKANO 3,436,952

DIE TIGHTENING CASE

Filed Sept. 2, 1966 Sheet 1 of 4

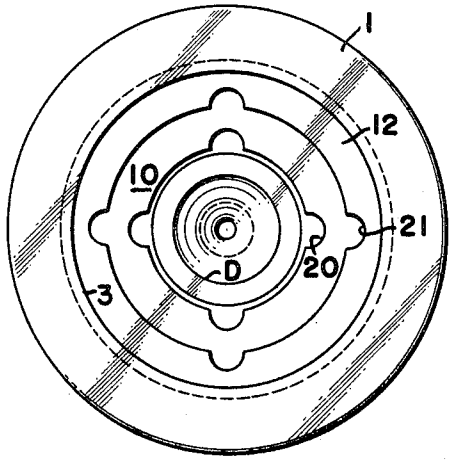


FIG. 1.

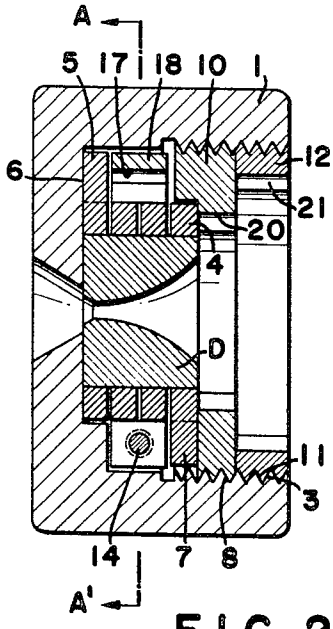


FIG. 2.

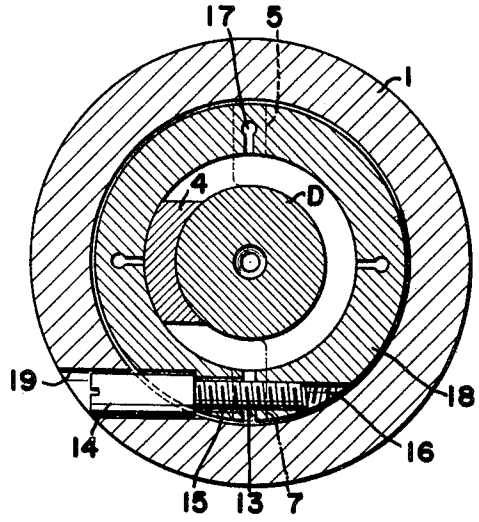


FIG. 3.

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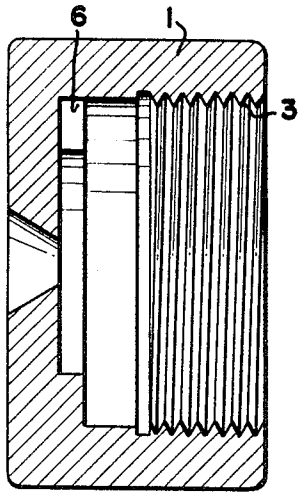


FIG.5.

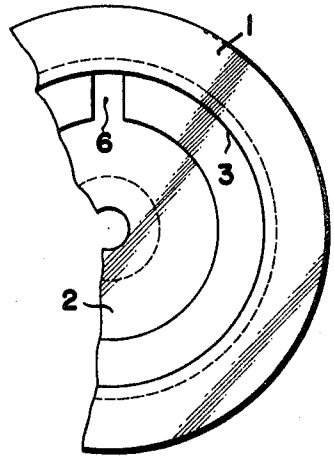


FIG.4.

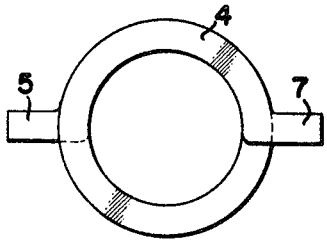


FIG.6.

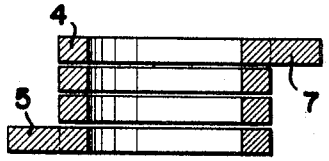


FIG.7.

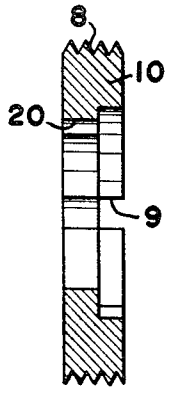


FIG.9.

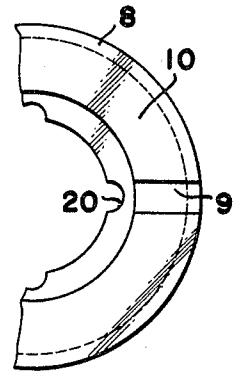


FIG.8.

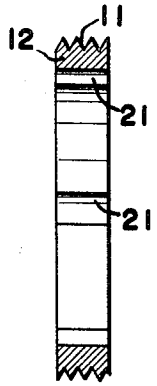


FIG.11.

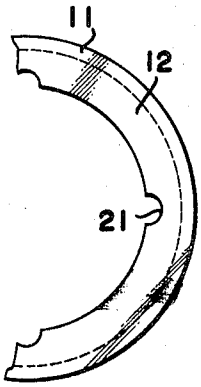


FIG.10.

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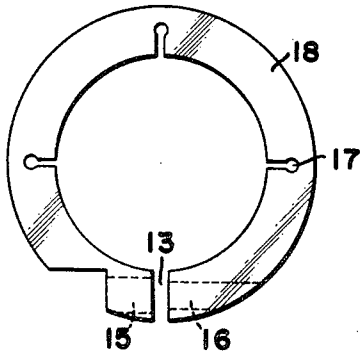


FIG.12.

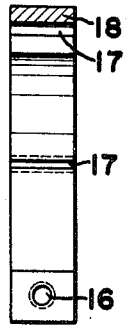


FIG.13.

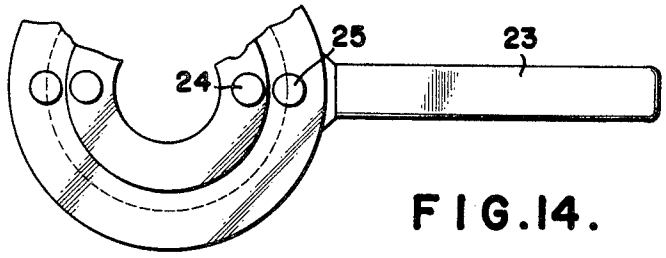


FIG.14.

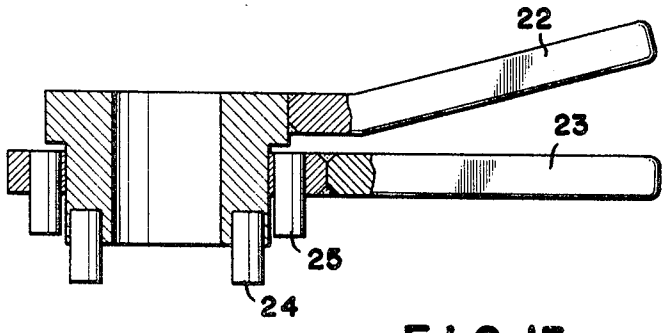


FIG.15.

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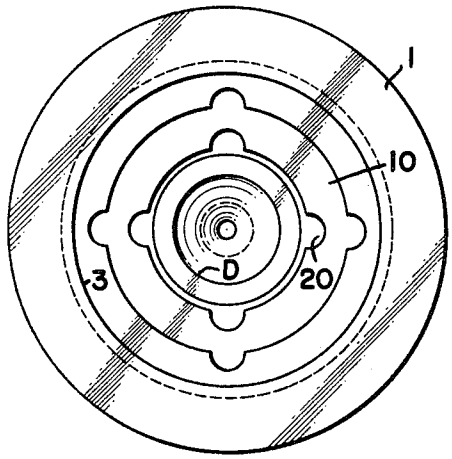


FIG. 16.

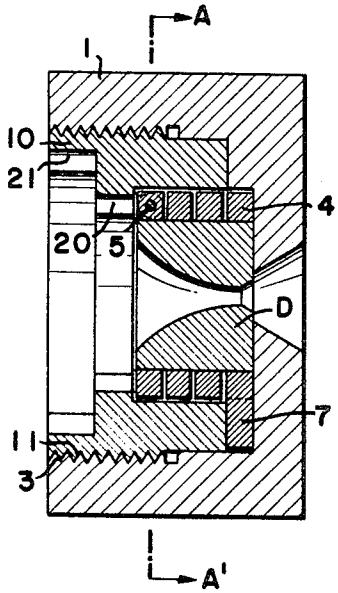


FIG. 17.

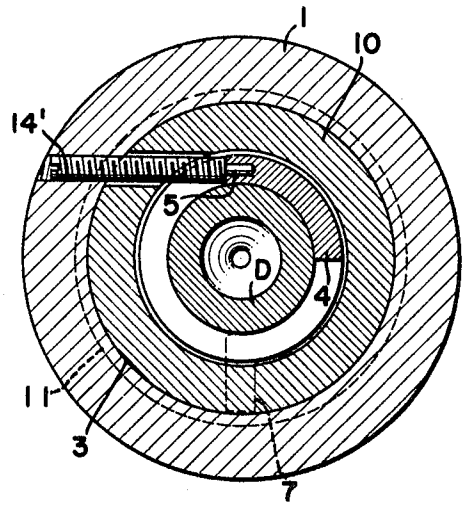


FIG. 18.

United States Patent Office

3,436,952

Patented Apr. 8, 1969

3,436,952

DIE TIGHTENING CASE

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Filed Sept. 2, 1966, Ser. No. 577,070
Claims priority, application Japan, Sept. 8, 1965, 40/54,612
Int. Cl. B21c 3/00; B21d 37/04; B29f 3/00
U.S. Cl. 72—467 6 Claims

ABSTRACT OF THE DISCLOSURE

A drawing die having a hollow case body of cylindrical shape with a groove at one end in which is engaged a projection of a band in the shape of a coil spring encircling a die nib inserted therein. The band includes a second projection at an end opposite the first projection which is received in a groove in a ring threadably engaged in the case body. Consequently, by screwing the ring into the case body, the coils of the band are compressed to forcibly engage the outer surface of the die nib and hold the same in locked engagement in the case body.

This invention relates to improvements in a die case which secures a die nib by a tightening band of coil spring shape.

A die is composed of a part of abrasion-resistant hard metal (hereinafter referred to as a "nib") and a part of the case holding and securing the same nib.

In hitherto known methods for securing a die nib in a steel case, shrinkage fits, force fits, caulking, brazing or the like, have been adopted. However, in these methods such disadvantages or difficulties as described below have been found.

For example, in the case of shrinkage, the nib is tightened into the case by a shrinkage force due to the expansion coefficient of the metal, but it is difficult to obtain a certain rate of shrinkage. When a furnace is used for obtaining constant temperature, it takes too long so that mostly a direct flame is used against the die case for heat treatment. Therefore, the die case which has been hardened might become tempered whereby the characteristics of the case might be lost. Or the nib might be cracked because of overtightening or by the sizes of the nib becoming too small even if the material of the nib and the case are made of the same material.

In the case of force fit, the nib is forcibly fit within the case by a strong force, and thereby deformation or breaking of the nib may occur. And in case of a shrinkage fit or a force fit, the outer circumference of the nib should be of the same shape as the inner circumference of the case; therefore, if the nib is of elliptical shape, the case has to have the same outer shape. Especially, when the diameter of the nib is of the order of about 10 mm., it takes considerable time and skill to fit the nib into the case. In the case of brazing, there is no tightening force applied from outside, and it is very difficult to effect brazing over the entire outer circumference of the nib. Moreover, small bubbles may exist between the case and the nib, which complicates the brazing process, and requires, for example, a vacuum process. As above stated, in any hitherto known way, making the outer circumference of the nib the same as the inner circumference of the case and securing the nib in the case is laborious work. Further, if the nib is rendered unfit after installation, the case is also unusable. Even if the nib is removed from the case, the case must be ground again.

The present invention provides a new die tightening case which overcomes the difficulties above-stated. According to the invention there is provided a drawing die

comprising a hollow case body of cylindrical shape having an open end, and a closed end with an aperture therein, said case body having internal threads therein at said open end, said case body having a groove in the inner surface thereof at said closed end, a die nib coaxially disposed in said case body and having a die opening in alignment with said aperture in the closed end, a band in the shape of a coil spring encircling said die nib, said band having opposite ends and including projections at each end, one of said projections being inserted in said groove, and a ring having external threads engaged with the threads of said case body, said ring having a groove receiving the other projection of said band whereby by screwing the ring into said case body the coils of the band are compressed and forcibly engage the outer surface of the die nib to hold the same in locked engagement in the case body.

Additional objects and advantages will become apparent to those skilled in the art as the description proceeds in connection with the accompanying drawings, wherein:

FIG. 1 is a front view of an embodiment of the present invention.

FIG. 2 is a side view in section of the embodiment of FIG. 1.

FIG. 3 is a cross-sectional view taken along line A–A' in FIG. 2.

FIG. 4 is a front view of a part of the case body.

FIG. 5 is a longitudinal cross-sectional view of the body.

FIG. 6 is a front view of a nib tightening band.

FIG. 7 is a longitudinal cross-sectional view of the nib tightening band.

FIG. 8 is a front view of a part of a band winding ring.

FIG. 9 is a longitudinal cross-sectional view of the band winding ring.

FIG. 10 is a front view of a part of a slip-prevention nut for a band winding ring.

FIG. 11 is a longitudinal sectional view of the slip-prevention nut for the band winding ring.

FIG. 12 is a front view of an auxiliary tightening ring.

FIG. 13 is a longitudinal sectional view of the auxiliary tightening ring.

FIG. 14 is a front view of a tightening handle.

FIG. 15 is a longitudinal cross-sectional view of the tightening handle.

FIG. 16 is a front view of another embodiment of this invention.

FIG. 17 is a longitudinal sectional view of the body of FIG. 16.

FIG. 18 is a cross-sectional view taken along line A–A' in FIG. 17.

In one embodiment of this invention as shown in FIGS. 1–15, the die tightening case of this invention includes a nib tightening band **4** of coil spring shape provided at the inside of a case body **1**, a band winding ring **10** screwed into the case body **1**, both ends **5**, **7** of said nib tightening band **4** being respectively fit into said case body **1** and the band winding ring **10**. The die nib D is assembled inside of the nib tightening band **4** by screwing said band winding ring **10** into the inside of the case body **1**. Case body **1** is of cylindrical shape and is provided with a flange **2** at an end thereof and with a thread at the inner surface near the other end thereof. A groove **6** is formed in case **1** to receive end **5** of nib tightening band **4**, both ends **5** and **7** extending outwardly and being inserted into the case body **1** concentrically. Band winding ring **10** is provided with thread **8** on its outside surface and with a groove **9** to receive to end **7** of the nib tightening band, and the ring **10** is screwed into the case body **1**. A slip prevention nut **12** is provided with thread **11** on its outer surface and is screwed into the case body **1** concentrically.

An auxiliary tightening ring **18** with a gap **13** is provided with a smooth hole **15** and a threaded hole **16** to receive a tightening bolt **14**. The ring **18** has several grooves **17** at its interior surface where the outer circumference of the nib tightening band is received.

The casing **1** is provided with a hole **19** to pass the tightening bolt **14**.

Several grooves **20** and **21** are provided inside of the band winding ring **10** and the escape prevention nut **12** respectively for turning the same in the casing. For this purpose, bosses **24** and **25** of tightening handles **22** and **23** are adapted to be fitted in grooves **20** and **21**.

In operation the die nib D is inserted into the case body **1** and a nib tightening band **4** is provided at the outer circumference of the die nib D, and an end **5** of the said nib tightening band **4** is engaged in groove **6** of the case body **1**, a band winding ring **10** is screwed into the case body **1** while the other end **7** of the nib tightening band **4** is engaged in groove **9**. The slip prevention nut **12** for the band winding ring **10** is then screwed into the case body **1**. The boss **24** of the tightening handle **22** is engaged in the groove **20** of the band winding ring **10**, and turned, and the tightening band **4** is rotated and its diameter decreases to tightly engage the die nib D. The tightening band **4** tightens the nib D circumferentially and the tightening force at every part of the tightening band **4** is equalized. Thus the nib tightening band **4** can be easily adapted to any changes in the outer shape of the die nib D. Moreover, the case can be repeatedly used by replacing the die nib D.

When the boss **25** of the tightening handle **23** is engaged in groove **21** of the slip prevention nut **12** for the band winding ring **10** and the tightening handle **23** turned, the band winding ring **10** is secured and can not be loosened. Auxiliary tightening ring **18** is previously fit on the outer circumference of the nib tightening band **4** and the auxiliary tightening ring **18** is tightened by tightening bolt **14** to aid in the tightening of the nib tightening band **4**. It is also possible to operate the die tightening case of this invention without the auxiliary tightening ring. If desired, a part of the auxiliary tightening ring **13** can pass cooling water to cool the die nib as well as die case which are heated by the heat produced during the process of drawing or pressing.

The object and advantage of this invention can be also achieved by the embodiment in which the band winding ring **10** and slip prevention nut **12** are secured to form a single ring.

In the embodiment in which ring **18** is omitted, the space previously occupied by the auxiliary tightening ring may be filled by a ring without any slits, or such space may be left empty.

It is also possible to use another shape of band winding ring **10** to fill the space. FIGS. 16 to 18 show an embodiment of this type. In this embodiment a coil of the nib tightening band **4** is engaged by nut **14**.

This die case, according to this invention, is useful for pressing as well as drawing.

Although preferred embodiments of this invention have been shown and described herein, it is to be understood that this description is merely illustrative and not limiting and that this invention is to be limited only by the scope of the appended claims.

I claim:

1. A drawing die comprising a hollow case body of cylindrical shape having an open end, and a closed end with an aperture therein, said case body having internal threads therein at said open end, said case body having a groove in the inner surface thereof at said closed end, a die nib coaxially disposed in said case body and having a die opening in alignment with said aperture in the closed end, a band in the shape of a coil spring encircling said die nib, said band having opposite ends and including projections at each end, one of said projections benig inserted in said groove, and a ring having external threads engaged with the threads of said case body, said ring having a groove receiving the other projection of said band whereby by screwing the ring into said case body the coils of the band are compressed and forcibly engage the outer surface of the die nib to hold the same in locked engagement in the case body.

2. A die as claimed in claim 1 comprising an auxiliary ring surrounding said band, and means for tightly clamping said auxiliary ring on said band to clamp the same in turn against said die nib.

3. A die as claimed in claim 2 comprising a slip prevention nut threaded in said case body on a side of the ring opposite the band.

4. A die as claimed in claim 2 wherein said auxiliary ring has radial grooves therein to enable the auxiliary ring to vary its internal diameter.

5. A die as claimed in claim 4, wherein said auxiliary ring is provided with a radial gap, said means for clamping the auxiliary ring on the band comprising means for closing said gap.

6. A die as claimed in claim 5, wherein said means for closing said gap comprises a screw threadably engaged with the auxiliary ring at one side of said gap and held in said case body against axial advancement.

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MILTON S. MEHR, *Primary Examiner.*

U.S. Cl. X.R.

18—12; 72—481