Jan. 9, 1951 D. C. FONDA 2,537,340

CARBIDE TIPPED GAUGE BLOCK

Filed Sept. 28, 1945

Fig. 1.

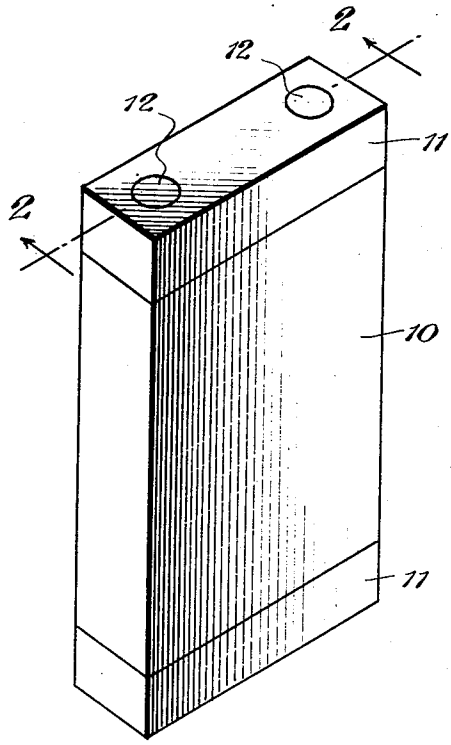
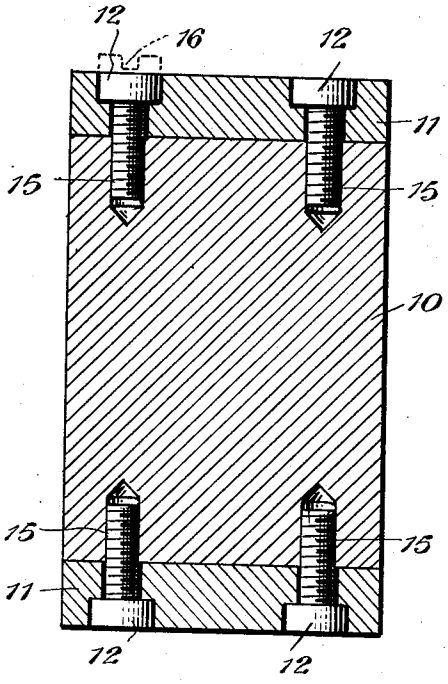


Fig. 2.



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Patented Jan. 9, 1951

2,537,340

UNITED STATES PATENT OFFICE

2,537,340

CARBIDE TIPPED GAUGE BLOCK

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Application September 28, 1945, Serial No. 619,197

5 Claims. (Cl. 33—168)

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This invention relates to gage blocks and more particularly to gage blocks tipped with tungsten carbide for increasing the useful life of the blocks by making them more resistant to wear.

It is an object of this invention to provide an improved steel gage block tipped with tungsten carbide and constructed in such a way that the block will not lose its flatness as a result of the different coefficients of expansion of the steel and tungsten carbide. Another object is to provide a method of making such blocks.

One feature of the invention relates to the fastening of the carbide tips to the intermediate steel portion of the block by fastening means that hold the tips firmly against the steel portion but allow limited shifting of the contacting steel and tungsten carbide surfaces over one another. It is this feature that makes it possible for the tips and body of the block to expand at different rates, with change of temperature, without affecting the flatness of the gaging surfaces. Without this feature, differential expansion would either warp the block in the way that a bimetal thermostat warps, or would set up stresses which would ultimately impair the accuracy of the gage block.

Another object of the invention is to provide an improved method for making composite gage blocks of extreme accuracy. This object is attained by forming the carbide tips for cooperation with the fastening means, by lapping those surfaces of the component parts which are to be brought together in the assembled block, then fastening the parts together, after which the gaging surfaces, and in some cases the fastening elements, are lapped to bring the block to its final dimensions.

Other objects, features and advantages of the invention will appear or be pointed out as the description proceeds.

In the drawing, forming a part hereof, in which like reference characters indicate corresponding parts in all the views,

Figure 1 is a perspective view of a gage block made in accordance with this invention.

Figure 2 is a sectional view taken on the plane 2—2 of Figure 1.

The gage block shown in the drawing includes an intermediate body portion 10 which is preferably made of carbon steel and not hardened. By using unhardened steel it is unnecessary to subject the blocks to a stabilizing operation. This is an important advantage because hardened steel gage blocks change in size if they are not stabilized, and stabilizing treatments add greatly

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to the labor and time required to make a gage block.

At either end of the intermediate body portion 10 there is a tungsten carbide tip 11 which is of the same cross section as the body portion 10 and secured to the body portion by fastening means, preferably screws 12. The tips 11 are made of tungsten carbide and the openings for the screws are preferably formed in the tips during the sintering operation by which the tips are made. Carbide tips of at least ¼ inch thickness give the best results. Thinner tips sometimes warp.

The openings in the tips 11 for receiving screws 12 have countersunk upper ends into which the heads of the screws extend, and the lower portions of these openings are slightly larger than the outside diameter of the threads of the screws 12. The heads of the screws are preferably cylindrical and of slightly smaller diameter than the counter-sunk portions of the openings into which they extend. Experience has shown that a "running clearance" of approximately 0.0005 inch around the heads and threads of the screw 12 is sufficient to permit a limited movement of the tip 11 over the face of the body portion 10 with which it contacts. A "running clearance" is a clearance sufficient to permit a part to move freely with respect to an adjacent surface of another part.

The shoulder at the bottom of the head of the screw 12 clamps the tip 11 firmly against the body portion 10 of the block, but the clearance around the head and threads of the screws 12 permit the tip 11 to expand at a different rate from the steel body portion 10 without warping the tip or setting up thermal stresses within the block.

There are holes 15 drilled and tapped in the body portion 10 for receiving the screws 12. In the manufacture of the block, the holes 15 are drilled before the end faces of the intermediate body portion 10 have been lapped. Before assembly of the parts, the end faces of the body portion 10 are lapped to about a class B finish.

Before assembly, the openings and countersinking of tips 11 are cleaned out with a cylindrical lap charged with diamond dust. The bottom face of the upper tip 11, and the top face of the lower tip 11 are lapped, and the tips are then assembled with the body portion 11 in the manner illustrated in Figure 2. The parts are of such dimensions that the total height of the composite block at the time of assembly measures approximately 15 to 20 thousandths of an

inch more than the desired dimension of the block between the gaging surfaces.

In the illustrated construction the screws 12 originally have heads in which there are slots 16, and the slotted portion of the screw heads are above the face of the tip 11. After assembly of the tips and body portion, the blocks are beveled by just breaking the corners, the slotted portions of the screws 12 are ground off flush with the surface of the block tip, and the composite block is then lapped to final size. Other types of screws can be used, including screws having slotted heads, or other tool-receiving recesses, below the gaging surfaces of the block.

The blocks can be made with screw heads that are slightly lower than the gaging surfaces, and this does not interfere with the accuracy of the blocks in use because of the measurements taken across the entire face of the block.

I claim as my invention:

1. A gage block including a metal body portion having smooth upper and lower end faces, tips made of material harder than the body portion of the block and each having a different coefficient of expansion from the body portion and overlying both the upper and lower end faces of the body portion, each of said tips having a smooth inner face that contacts with an end face of the body portion, and each of said tips having an outer face that comprises one of the gaging surfaces of the block, a plurality of screws extending through transversely spaced openings in each of the tips and through said upper and lower end faces of the body portion and threading into the body portion of the gage block, at least one of said screws through each tip having an enlarged part that bears against an inside surface of the opening in the tip and by pressure against said inside surface clamps the tip firmly against the end face of the body portion with a limited clamping force, the opening through the tip having some clearance around the screw that has the enlarged part so that the limited clamping force and clearance leave the confronting surfaces of the body portion and tip free to slide on one another transversely of the gaging dimension of the block in response to thermal expansions and contractions of said block.

2. The gage block described in claim 1 with the metal body portion of the block of unhardened steel and with tungsten carbide tips.

3. A gage block comprising a body portion with end faces spaced from one another in the direction of the gaging dimension of the block, tips of substantially harder material covering said end faces and each having a different coefficient of expansion than that of the body portion, transversely spaced fastening means connecting each of the tips to the body portion of the block, said fastening means including at least two fastening elements extending through substantially aligned openings in the confronting faces of the tip and block and holding the tip and body portion in a predetermined relation to one another with the tip clamped against the end face of the body portion with a limited clamping pressure that prevents relative movement of the tip and body portion in the direction of the gaging dimension of the block, at least one of the fastening elements for each tip having clearance around it for a portion of its length correlated with the coefficients of expansion of the tip and body portion and sufficient to provide for relative movement of the tip and body portion transversely of the gaging dimension of the block during thermal expansion and contraction of the block within its intended range of operating temperature.

4. The gage block described in claim 3 and in which the body portion of the block is made of unhardened steel, and the tips are made of tungsten carbide.

5. A gage block comprising an unhardened steel prism of rectangular transverse cross-section and with side walls and upper and lower end faces, two tungsten carbide tips of substantially less height than the steel prism but of the same transverse cross-section as the steel prism and having side walls that form flush continuations of the side walls of the prism, each of the tips having a lapped face in contact with a lapped face of the prism and having two openings therethrough on different sides of the center of the end faces of the tip and having a counter-bore that forms a shoulder intermediate the upper and lower ends of the opening, said shoulder lying in a plane substantially normal to the axis of the opening, screws extending through the openings in the tips and threading into openings in the end faces of the prism, each of said screws having a head that provides an annular shoulder with a surface in a plane normal to the axis of the screw and in contact with the surface of the shoulder formed by the counter-bore, said screws comprising permanent, non-adjustable connections between the tips and the prism and having the upper ends of their heads plane and said screws comprising continuous surfaces flush with the gaging surfaces of the carbide tips and the screws having clearance in the openings through the tips to allow for the different thermal expansion of the steel prism and carbide tips.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,398,311	Bartholdy	Nov. 29, 1921
1,499,731	Hanson	July 1, 1924
2,208,371	Johansson	July 16, 1940

FOREIGN PATENTS

Number	Country	Date
741,729	France	Feb. 18, 1933