(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 273 359 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **87119033.6**

(51) Int. Cl.⁴: **G04B 37/22**

(22) Date of filing: **22.12.87**

(30) Priority: **29.12.86 JP 314191/86**

(43) Date of publication of application:
06.07.88 Bulletin 88/27

(84) Designated Contracting States:
CH DE LI

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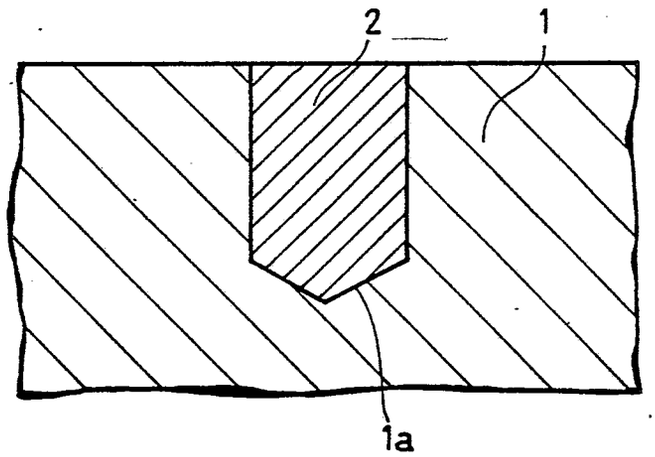
(54) **Workpiece for a watchcase.**

(57) A workpiece for a watchcase comprises a worked part (2, 4) to be machined and a base part (1, 3) joined by diffused junction with the worked part (2, 4), which is prepared by a material being superior in machinability to that for the base part (1, 3).

FIG.1



Workpiece for a Watchcase

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a workpiece employed for a watchcase of a wrist watch.

Description of the Prior Art

A hard alloy is generally employed for a case of a wrist watch, which is easily scratched. In particular, cemented carbide is employed as a material for the watchcase of a high-grade wrist watch.

However, an extremely hard material such as cemented carbide causes a problem in working, in employment for a watchcase.

High working accuracy is required for an inner portion of the watchcase, i.e., an inner shell portion which is adapted to store precisely designed watch parts. When a workpiece for the watchcase is prepared by cemented carbide, such an inner shell portion is generally worked by electric discharge machining, which requires a long time.

Further, a tapped hole is formed in the watchcase by electric discharge machining, and thereafter a thread bush of a workable material is embedded in the tapped hole, to be subjected to brazing. When the workpiece for the watchcase is prepared by cemented carbide, therefore, workability in electric discharge machining of the tapped hole is particularly inferior, to require a long time for such working.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a workpiece for a watchcase, which is excellent in machinability and manufactured at a low cost.

The workpiece for a watchcase according to the present invention comprises a worked part to be machined and a base part joined through diffused junction with the worked part, which is prepared by a material being superior in machinability to that for the base part.

Thus, the worked part of the inventive workpiece for a watchcase can be easily machined in high accuracy, to require no electric discharge machining for a long time as in the conventional case.

Further, diffused junction is employed in order to join the worked part of the inventive workpiece for a watchcase to the base part. Therefore, the worked part can be joined to the base part simultaneously with sintering of the base part to require no brazing step of the conventional case, for example. Thus, steps for manufacturing the workpiece can be extremely simplified.

According to the present invention, the worked part is prepared by a material which is superior in machinability to that for the base part. When the base part is prepared by cemented carbide, the worked part is preferably prepared by a metal selected from groups IV, V and VI of the periodic table or an alloy of two or more such metals. Particularly when the cemented carbide is WC-Co cemented carbide, the material for the worked part is preferably prepared by Mo, W or Ta, most preferably by Mo in view of junction strength. When the cemented carbide is TaC-Ni cemented carbide, the worked part is preferably prepared by Mo or a W-Ni alloy, most preferably by the W-Ni alloy in view of junction strength.

Diffused junction in the present invention is preferably performed by sintering diffused junction or HIP (hot isostatic pressing) diffused junction in view of manufacturing steps. Such sintering diffused junction and HIP diffused junction may be combined with each other. In case of such combination, HIP diffused junction may be performed after sintering diffused junction, or sintering diffused junction and HIP diffused junction may be simultaneously performed.

For example, a sintered worked part may be brought into close contact with an unsintered base part, which in turn is sintered in this state, to thereafter perform HIP forming. Alternatively, an unsintered worked part may be brought into close contact with an unsintered base part so that both of the base part and the worked part are sintered in this state, to thereafter perform HIP forming. Further, a sintered worked part may be brought into close contact with a sintered base part to be re-sintered, to thereafter to perform HIP forming.

It may be considered that carbide of the material for the worked part is formed in the junction interface in diffused junction, to improve junction strength.

A material of excellent machinability is joined by diffused junction to the worked part of the inventive workpiece for a watchcase, which can be easily machined in high accuracy. Thus, the workpiece according to the present invention can be worked in a short time with no electric discharge machining, which has been generally required in the prior art.

Due to employment of diffused junction, the worked part can be joined to the base part in sintering or HIP forming of the base part. Thus, no conventional brazing step is required and the manufacturing steps can be extremely simplified, whereby the workpiece according to the present invention can be manufactured at a low cost.

These and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view showing an embodiment of the present invention in a state before tapped hole working;

Fig. 2 is a sectional view showing the embodiment of the present invention in a state after tapped hole working;

Fig. 3 is a front elevational view showing another embodiment of the present invention; and

Fig. 4 is a sectional view taken along the line IV - IV in Fig. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiment 1

As shown in Fig. 1 in section, a sintered worked part 2 was embedded in a hole 1a of an unsintered base part 1, which was then sintered and subjected to HIP forming to provide a workpiece for a watchcase. Table 1 shows combinations of materials for such base parts and worked parts. The worked part 2 of each workpiece for a watchcase thus obtained was subjected to tapped hole working as shown in Fig. 2, and workability thereof was evaluated as an index. Evaluation was made on working steps and working ability thereof. The working steps were formed by a tapped hole working (drilling) step and a screw cutting step, and the average value in working ability of the two steps was expressed as an index.

For the purpose of comparison, workability indices were also evaluated as to the case of performing tapped hole working of base parts joined with no worked parts, to be listed in Table 1. In each case, such evaluation was made on working steps and working ability thereof, similarly to the above. The working steps were formed by a tapped hole working (electric discharge machining) step and a brazing step, and the average value in working ability of the two steps was expressed as an index.

Table 1

	Base Part	Worked Part	Workability Index
Example A	WC-Co Cemented Carbide	Mo	100
Example B	-do.-	W	100
Example C	-do.-	Ta	90
Reference Example D	-do.-	None	37.5
Example E	TaC-Ni Cemented Carbide	Mo	100
Example F	-do.-	W-Ni Alloy	100
Reference Example G	-do.-	None	35

Embodiment 2

As shown in Fig. 3, a worked part 4 was joined by diffused junction to a base part 3 forming an inner shell portion of a watchcase. Fig. 4 is a sectional view taken along the line IV - IV of Fig. 3. Table 2 shows combinations of materials for such base parts and worked parts. Diffused junction of each Example was performed by bringing a sintered worked part into close contact with an unsintered base part, sintering the base part in this state and then performing HIP forming.

A workability test was performed on each workpiece thus obtained. Workability was evaluated by measuring a working time required for cutting by 0.3 mm through machining. Table 2 shows the results of measurement. For the purpose of comparison, times required for working by 0.3 mm through electric discharge machining were also measured on reference examples formed by only base parts, to be listed in Table 2.

Table 2

	Base Part	Worked Part	Working Time
Example H	WC-Co Cemented Carbide	W-Ni Alloy	0.1
Example I	-do.-	Mo	0.3
Example J	-do.-	Ni	0.2
Reference Example K	-do.-	None	0.5 (electric discharge machining)
Example L	TaC-Ni Cemented Carbide	Mo	0.3
Example M	-do.-	W-Ni Alloy	0.1
Reference Example N	-do.-	None	0.5 (electric discharge machining)

As obvious from Table 2, each workpiece according to the embodiment of the present invention can be worked in a short time as compared with the case of working the workpiece formed by only a base part by electric discharge machining.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of the present invention being limited only by the terms of the appended claims.

Claims

1. A workpiece for a watchcase comprising:
a worked part (2, 4) to be machined; and
a base part (1, 3) joined with said worked part by diffused junction,
said worked part (2, 4) being prepared by a material being superior in machinability to that for said base part (1, 3).

2. A workpiece for a watchcase in accordance with claim 1, wherein
said base part (1, 3) is prepared by cemented carbide.

3. A workpiece for a watchcase in accordance with claim 2, wherein
said cemented carbide is WC-Co cemented carbide.

4. A workpiece for a watchcase in accordance with claim 2, wherein
said cemented carbide is TaC-Ni cemented carbide.

5. A workpiece for a watchcase in accordance with claim 1, wherein
said worked part (2, 4) is prepared by a metal selected from groups IV, V and IV of the periodic table or an alloy of two or more such metals.

6. A workpiece for a watchcase in accordance with claim 3, wherein
said worked part (2, 4) is prepared by Mo, W or Ta.

7. A workpiece for a watchcase in accordance with claim 4, wherein
said worked part (2, 4) is prepared by Mo or a W-Ni alloy.

8. A workpiece for a watchcase in accordance with claim 1, wherein
said diffused junction is sintering diffused junction.

9. A workpiece for a watchcase in accordance with claim 1, wherein
said diffused junction is HIP diffused junction.

10. A workpiece for a watchcase in accordance with claim 1, wherein
said diffused junction is achieved by sequentially performing sintering and HIP.

11. A workpiece for a watchcase in accordance with claim 1, wherein said diffused junction is achieved by simultaneously performing sintering and HIP.
12. A workpiece for a watchcase in accordance with claim 1, wherein said worked part (2, 4) is a part subjected to tapped hole working.
13. A workpiece for a watchcase in accordance with claim 1, wherein said worked part (2, 4) is an inner shell portion of said watchcase.

FIG.1

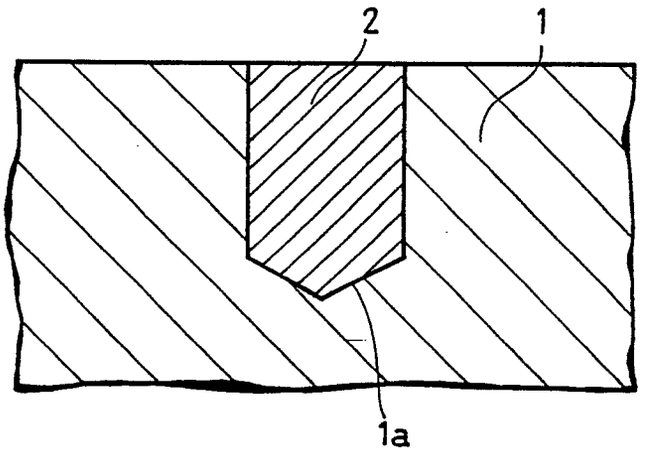


FIG.2

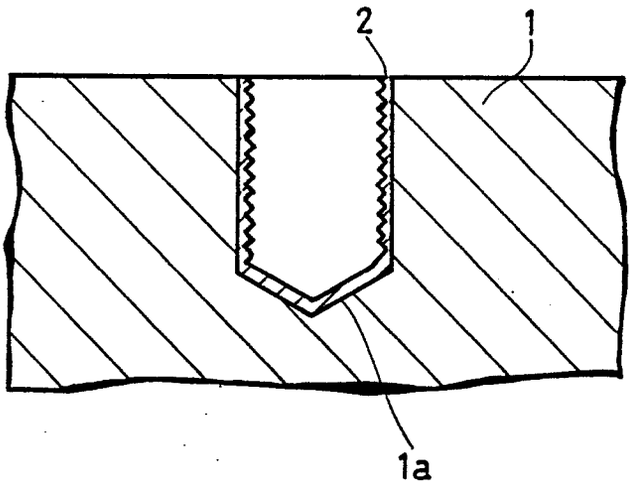


FIG.3

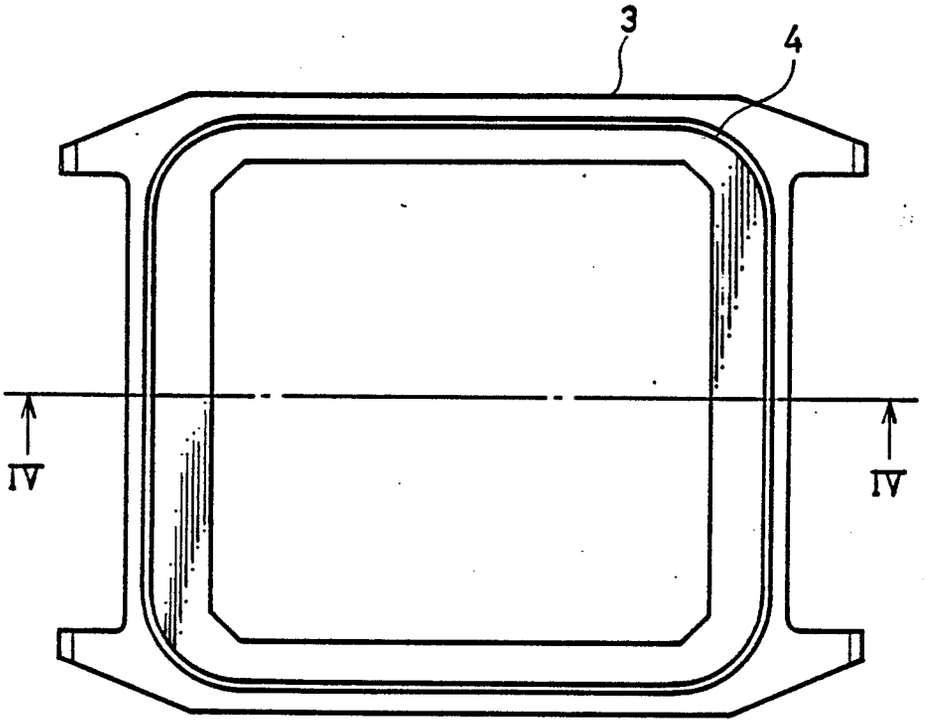


FIG.4