

Sept. 21, 1971

J. S. HILL

3,606,766

GOLD FINGER ARTICLE COMPOSED OF COMPRESSED AND SINTERED  
FINE GOLD POWDER AND A REFRACTORY OXIDE  
Filed June 26, 1969

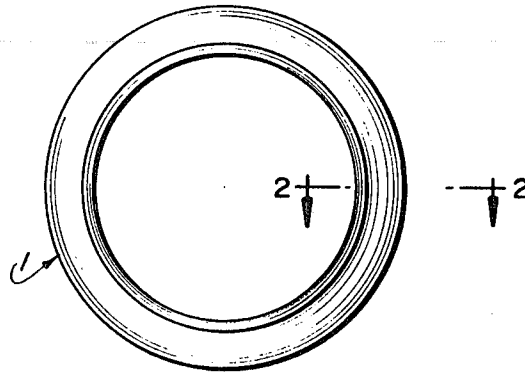


**FIG. 1**

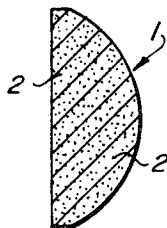


**FIG. 2**

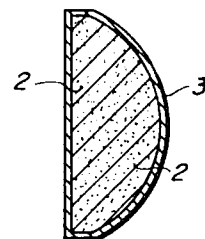


**FIG. 3**

INVENTOR.

JAMES S. HILL

BY

*John B. Kovalich*

AGENT

1

3,606,766

## GOLD FINGER ARTICLE COMPOSED OF COMPRESSED AND SINTERED FINE GOLD POWDER AND A REFRACTORY OXIDE

James S. Hill, Cranford, N.J., assignor to Engelhard Minerals & Chemicals Corporation, Newark, N.J.

Filed June 26, 1969, Ser. No. 836,735

Int. Cl. A44c 9/00

U.S. Cl. 63—15

5 Claims

### ABSTRACT OF THE DISCLOSURE

A gold finger ring composed of compressed and sintered fine gold powder having uniformly dispersed therethrough from 0.03% to 0.2% of refractory oxide particles having a size between 0.5 and 5 microns.

### BACKGROUND OF THE INVENTION

Gold finger rings are usually composed of cast gold alloys, e.g., 14 carat gold, which contain metal alloying components such as copper, silver and zinc. It is known that because of the presence of these metal alloying components the skin of the human finger in contact with the rings is sometimes subject to a reaction which may cause some peeling of the skin or a greenish discoloration of the skin.

This would not occur if the ring was composed of 24 carat gold, i.e. pure gold, but the 24 carat gold is too soft and the ring would not retain its shape and therefore, necessitates the addition of alloying metal components to harden the ring.

It is herein contemplated to provide a gold finger ring of substantially 24 carat gold (fine gold) which will overcome the above-mentioned disadvantages.

### SUMMARY OF THE INVENTION

In accordance with the invention, there is provided a gold finger ring composed essentially of fine gold powder (24 carat) in compressed and sintered condition having uniformly dispersed therethrough from 0.03% to 0.2% of refractory oxide particles having a size between 0.5 and 5 microns. The oxides within this size range are preferably obtained by the decomposition of a soluble salt of the metal forming the refractory oxide and effectively hardening the fine gold, when uniformly dispersed therethrough, to a hardness at least that of 18 carat gold while providing for a ductility sufficient to make the ring sizable from about 1/2 to 1 size larger than the originally formed ring.

### DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an elevational side view of the finger ring according to the invention,

FIG. 2 illustrates a cross-sectional view along lines 2—2 of FIG. 1, and

FIG. 3 illustrates a modification of FIG. 2.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2 of the drawings, the finger ring 1 is composed of compressed and sintered fine gold powder having uniformly dispersed therethrough from 0.03% to 0.2%, preferably from 0.1% to 0.15%, of refractory metal oxide particles 2 having a particle size between 0.5 and 5 microns. The refractory metal oxides are, for example,  $Al_2O_3$ ,  $ZrO_2$ ,  $ThO_2$ ,  $Y_2O_3$ ,  $SiO_2$  or  $MgO_2$ .

The following is an example method of manufacture of the ring:

2

### EXAMPLE

A 2" by 2" mold assembly was lubricated with a solution of stearic acid in trichloroethylene and charged with 6.0 troy ounces of fine gold powder. The gold powder was pressed in the mold under a load of 12 tons gauge pressure to yield a 0.291" thick bar. The gold bar was weighed and placed in a vacuum chamber where the air in the voids in the compressed bar was evacuated. The chamber was subsequently flooded with a 40% solution of  $Al(NO_3)_3$  while the chamber was under vacuum condition. The bar was removed, oven dried for 16 hours at 250° C., and cooled in a dessicator. The cooled bar was weighed and found to contain 0.10%  $Al_2O_3$ . Next, the bar was sintered in air for 2 hours at 900° C., coined at 20 tons gauge pressure and post sintered in air for 2 hours at 900° C. The gold workpiece was rolled to a 0.123" thick sheet with annealing between each rolling operation for 1/2 hour at 750° C.—800° C. Gold rings which retain their shape and have excellent wear characteristics were punched from the gold sheet. The outer surface of the rings were provided with a rounded contour by machining.

In accordance with the above example, three gold bars were each impregnated with a solution containing 20%, 25% and 30% zirconium nitrate, respectively, and provided zirconia contents of 0.10%, 0.15% and 0.27%, respectively. The three gold bars were compressed, sintered and rolled into workpieces similarly as in Example 1 and likewise similarly formed into gold rings.

It was also found that another gold bar, similarly to Example 1, was impregnated with a 10% solution of thorium nitrate and yielded about 0.2% of  $ThO_2$ .

Wear tests were conducted on a gold sheet sample material from which the rings of the invention were fabricated which clearly show that the dispersion strengthened gold has better wear characteristics than either fine gold or 18K yellow gold. These wear tests were conducted on a Taber Abraser, Model 174, under 125 gram load with green test wheels which were dressed before each test. The sheet sample size was 1" x 2" x 20 mil thickness. The observed weight loss given in the table below represents the average of three tests.

TABLE I.—WEAR CHARACTERISTICS OF GOLD SAMPLES

| Cycles     | Weight loss in grams |                   |                 |        |
|------------|----------------------|-------------------|-----------------|--------|
|            | Fine Au              | Au+0.705% $ThO_2$ | Au+0.2% $ThO_2$ | 18K Au |
| 1,000..... | 0.0173               | 0.0145            | .0046           | .0055  |
| 4,000..... | 0.0549               | 0.0442            | .0210           | .0280  |

From these tests it can be seen that strengthened gold with as little as .075%  $ThO_2$ , for example, gives a composite material with better wear characteristics than fine gold alone; and, if fine gold is strengthened with up to 0.2%  $ThO_2$  the wear characteristics even surpass 18K gold.

Regarding FIG. 3, the ring, after forming and machining, can be provided with a flash coating 3 of gold for the purpose of being capable of a higher polish.

While the above description relates specifically to gold finger rings, other articles of jewelry which are worn in contact with the human skin are also contemplated, such as earrings, neck chains and pendants.

I claim:

1. A gold finger ring consisting of compressed and sintered 24 carat fine gold powder having uniformly dispersed therethrough from 0.03% to 0.2% by weight of refractory oxide particles having a particle size between 0.5 and 5 microns.

2. A gold finger ring according to claim 1, wherein the fine gold powder has uniformly dispersed therethrough from 0.1% to 0.15% by weight of the refractory oxide.

3

3. A gold finger ring according to claim 1, wherein the refractory oxide is  $\text{Al}_2\text{O}_3$ ,  $\text{ZrO}_2$ ,  $\text{ThO}_2$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{SiO}_2$  or  $\text{MgO}$ .

4. A gold finger ring consisting of compressed and sintered 24 carat fine gold powder having uniformly dispersed therethrough from 0.03% to 0.2% by weight of refractory oxide particles having a particle size between 0.5 and 5 microns, said ring being coated with a gold flash coating.

5. An article of jewelry comprising a metal body for contact with the human skin, said metal body consisting of compressed and sintered 24 carat fine gold powder having uniformly dispersed therethrough from 0.03% to

4

0.2% by weight of refractory oxide particles having a particle size between 0.5 and 5 microns.

References Cited

UNITED STATES PATENTS

|           |         |                  |       |          |
|-----------|---------|------------------|-------|----------|
| 3,139,682 | 7/1964  | Grant            | ----- | 29—182.5 |
| 3,150,443 | 9/1964  | Alexander et al. | ----- | 29—182.5 |
| 3,218,135 | 11/1965 | Alexander et al. | ----- | 29—182.5 |

10 F. BARRY SHAY, Primary Examiner

U.S. Cl. X.R.

29—182.5; 75—165