size by the portion of the curve having maximum slope (strain rate sensitivity). In FIG. **8** hereof the critical strain rate is plotted against grain size for each temperature. Extrapolation of these curves to strain rates obtained during extrusion reveals the required grain size needed for the practice of the present invention.

Alternatively, a plot of the form of FIG. **9** hereof can be used to set the temperature and strain rate conditions for extrusion for a given grain size material.

EXAMPLES

Billets about 8.5 inches long and about 2.4 inches in diameter were prepared by charging plain carbon steel billet-cans with a composite metal powder mixture prepared from a master batch consisting of 300 g Cr, 67.5 g Al, 15 g Ti, 7.5 g Y_2O_3, and 1110 g Fe. The mean grain size of the grains within the powder particles was about 0.5 microns. The charge was packed by cold pressing at 20 tons. The billets were then capped and welded except for a tube which extended out of the back of each billet for evacuation purposes. The billets were evacuated to about 10^{-4} mmHg whereupon the tubes were pinched off at the billets and welded. Each billet was placed in a furnace and heated to the preheat temperature set forth in Table III below. Each billet was removed from the furnace and rolled in Fummite, a glass lubricant. A glass lubricant pad was placed in the container of the extrusion press before each extrusion and the container, pad, and die were heated to about 310° C. For each extrusion, the preheated billet was placed into the container of the extrusion press and extruded at the rate and with the die shown in Table III below.

Each extruded sample was then analyzed for texture by use of a Rigaku DMAX-II-4 diffractometer using an automatic pole figure device. Data were collected for the <110> reflection. The Decker method was employed in transmission and the Schultz method in reflection so that the entire pole figure could be obtained. (R. D. Cullity, "Elements of X-ray Diffraction", Addison-Wesley, Reading, MA, 1967, pp. 285–295). As shown in Table III below, most extruded samples exhibited strong texture except run 6 which was extruded in accordance with the present invention and was substantially free of texture.

TABLE III

DIE OF PRESENT INVENTION[1]				CONVENTIONAL DIE			
Run	Preheat Temp.	Extrusion Rate	Texture[2] (times random)	Run	Preheat Temp.	Extrusion Rate	Texture[2] (times random)
a.	1270° C.	250 mm/s	(s) > 16	i.	1270° C.	75 mm/s	(vs) > 25
b.	1270° C.	75 mm/s	(vw) < 5				
c.	1270° C.	16 mm/s	(s) > 16				
d.	1170° C.	250 mm/s	—	j.	1170° C.	75 mm/s	—
e.	1170° C.	75 mm/s	(s) > 20				
f.	1170° C.	16 mm/s	—				
g.	1070° C.	250 mm/s	—	k.	1070° C.	75 mm/s	—
h.	1070° C.	75 mm/s	—				

[1]die having an internal contour conforming substantially to the formula:

$$R = \sqrt{\frac{R_o}{\left[1 + \frac{\dot{\epsilon}}{v} x\right]}}$$

R = radius of die contour at a given point x along the major axis of the die orifice from the entry plane Y;
$\dot{\epsilon}$ = natural strain rate
v = rate of extrusion velocity of the ram of the extrusion press
R_o = radius of billet.
[2]the value under texture indicates the maximum pole density on a pole figure in terms of the pole density observed in a randomly oriented sample obtained from the corresponding extruded sample.
s = strong, vs = very strong, vw = very week

What is claimed is:

1. A method for extruding fine grain dispersion strengthened metallic powder material such that the resulting extruded product is substantially free of texture, which method comprises extruding a billet of dispersion strengthened metallic powder material comprised of one or more metals and one or more refractory compounds said powder material having a mean grain size less than about 5 microns and whose grain size is substantially stable at the extrusion conditions, through a die having an internal contour such that the material is subjected to a natural strain rate which is substantially constant as it passes through the die.

2. The method of claim **1** wherein the internal contour of the die is such that the area of cross-section of the material as it passes through the die conforms substantially to the formula:

$$A = \frac{A_o}{\left[1 + \frac{\dot{\epsilon}}{v} x\right]}$$

where

A is the area of cross-section at any point x along the major axis of the die orifice from the entry plane of the die;

Ao is the area of cross-section from the outer diameter of the billet;

$\dot{\epsilon}$ is the natural strain rate; and

v is the velocity of the ram of the extrusion press;

wherein the extrusion is performed at such a rate so that the natural strain-rate is kept substantially constant during extrusion.

3. The method of claim **2** wherein the metal constituent of the dispersion strengthened material is comprised of one or more metals selected from the group consisting of yttrium, silicon, and metals from Groups IVA, VA, VIA, and VIII of the Periodic Table of the Elements.

4. The method of claim **3** wherein the metal constitutent is iron or nickel based and has a mean grain size less than about 2 microns.

5. The method of claim **4** wherein the refractory constituent is selected from the group consisting of refractory oxides, carbides, nitrides and borides.

6. The method of claim **5** wherein the refractory constituent is a metal oxide.