

Feb. 4, 1964

R. H. HOLLOWAY

3,120,087

METHOD OF MOUNTING METALLOGRAPHIC SAMPLES

Filed Dec. 28, 1962

Fig. 1

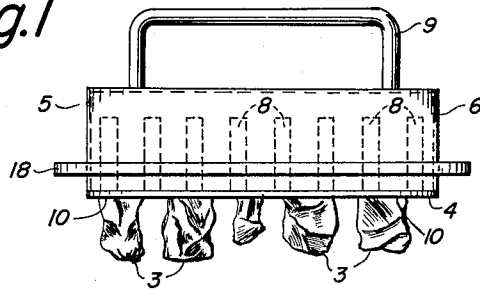


Fig. 2

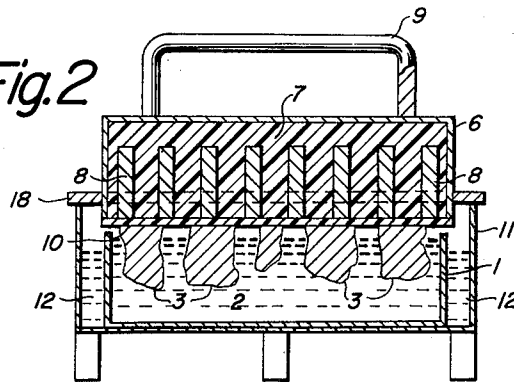
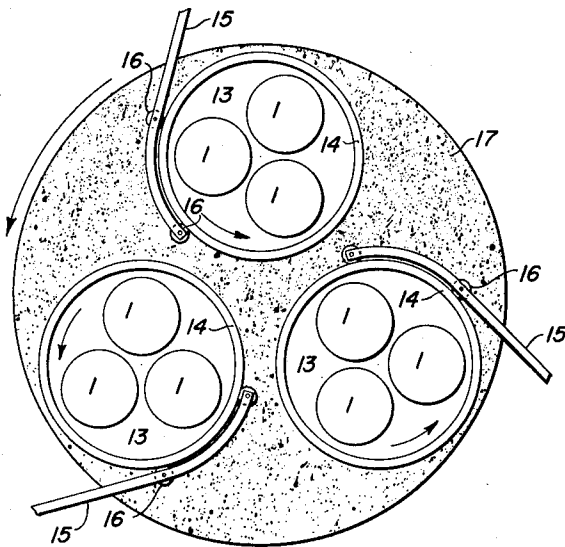


Fig. 3



INVENTOR
Robert H. Holloway

1

3,120,087
METHOD OF MOUNTING METALLOGRAPHIC
SAMPLES**Robert H. Holloway, 921 Magnolia Road,**
Hellertown, Pa.**Filed Dec. 28, 1962, Ser. No. 247,917**
9 Claims. (Cl. 51-281)

This invention relates to the mounting and polishing of metallographic samples and more particularly to a method of mounting a plurality of ferrous metallographic samples in a work holder suitable for use on an automatic lapping machine.

In preparing the surface of a metallographic sample for examination under a microscope it is essential that the surface of the sample be carefully ground and polished. Much of the grinding and polishing of such samples is still done by manual methods. In many large industrial plants and laboratories a large number of metallographic samples must be prepared every day and therefore lapping machines have been developed which will grind and polish the samples automatically. These lapping machines normally are designed to grind only standard sized disc-shaped samples or samples mounted individually in a thermosetting plastic mount. However, it is not always possible to obtain samples of standard shape and dimensions and the use of thermosetting plastic mounts becomes very expensive where a large number of samples must be prepared regularly. Furthermore the plastic mounts are usually designed to hold only a single sample or several very small samples in each mount and also require the sample identification to be placed on the mount rather than on the sample since the sample cannot readily be removed from the mount after polishing.

These limitations have prevented the automatic lapping machines from being widely accepted in plants and laboratories that must regularly prepare a large number of samples of all sizes and shapes. The result is that most of the preparation of odd-shaped or odd-sized metallographic samples is still done by hand which is not only time consuming but also a very expensive procedure.

It is therefore an object of my invention to provide a method of mounting metallographic samples in a work holder suitable for use on an automatic lapping machine.

It is a further object of my invention to provide a method of mounting a plurality of metallographic samples in a single, reusable work holder that will permit the simultaneous grinding and polishing of a large number of samples on a standard automatic lapping machine.

It is a still further object of my invention to provide a method of mounting a plurality of metallographic samples in a work holder which will insure that the samples will be ground uniformly and with precision.

Another object of my invention is to provide a method of mounting a plurality of odd-shaped or odd-sized ferrous metallographic samples that is simpler and more economical than anything heretofore proposed.

The foregoing objects and other objects and the means whereby they are accomplished will be more fully understood from the following description and claims in which:

FIGURE 1 is a side view of a holding magnet with a plurality of metallographic samples suspended from its face.

FIGURE 2 is a sectional view of the samples being placed in a bedding medium.

FIGURE 3 is a top plan view of a series of work holders containing samples which are being polished on one type of automatic lapping machine.

Referring to the drawings, my method of mounting a plurality of metallographic samples is as follows. A flat shallow circular metal pan 1 is partially filled with a

2

bedding material 2 as shown in FIGURE 2. The bedding material 2 is preferably an alloy having a relatively low melting point. I prefer to use an alloy having the following composition:

	Percent
5 Bismuth -----	48.00
Lead -----	25.63
Tin -----	12.77
Cadmium -----	9.60
10 Indium -----	4.00

An alloy of this composition has a melting point of 142-149° Fahrenheit. Other low melting point alloys can be used.

15 If the bedding material 2 is placed in the pan 1 while in a solid state the pan is heated until the bedding material 2 becomes molten.

Next, I place the ferrous metallographic samples 3 which are to be polished against the flat face 4 of a holder magnet 5 as shown in FIGURE 1. Although the holder magnet 5 could be a large permanent magnet or an electromagnet I prefer to fabricate the holder magnet 5 in the form shown by FIGURE 1 to reduce its weight and enable it to be lifted with one hand.

25 The holder magnet 5 as shown in FIGURE 1 consists of a closed cylindrical metal container 6 filled with a non-magnetic matrix 7 which contains a number of small permanent magnets 8. A thin flat face plate 4 of non-magnetic material seals one end of metal cylinder 6. A handle 9 is used to lift the holder magnet 5. The ferrous samples being magnetic are held securely to the face plate 4 by the permanent magnets 8 as shown by FIGURE 1 and the samples 3 when so placed have their flat faces 10 all in a common plane.

35 Next, the holder magnet 5 with ferrous samples 3 suspended underneath is placed above pan 1 containing the molten bedding material 2. A flange 18 holds the face plate 4 slightly above the rim of pan 1 so that the rim itself will not be ground away during the subsequent grinding and polishing operation. The bedding material 2 is then cooled by placing the pan 1 in a larger pan 11 containing a cooling medium 12 such as water. This step is shown in FIGURE 2.

45 When the bedding material 2 has solidified the holder magnet 5 is removed leaving the samples 3 firmly embedded in the bedding material 2. By keeping the level of the bedding material 2 below the rim of the pan 1, the flat faces 10 of the samples 3 remain exposed above the level of the bedding material. This prevents the bedding material 2 from being ground away during the subsequent grinding and polishing operation and clogging the abrasive wheel 17.

55 The pan 1 containing the samples 3 is now inverted and placed with the faces 10 of the samples against the abrasive wheel 17 as shown in FIGURE 3. FIGURE 3 shows one type of automatic lapping machine with nine of the sample holding pans 1 in position. On this type of machine the pans 1 are placed inverted in a circular fiber or plastic cut-out 13 whose edge is strengthened by a metal retaining ring 14. A curved arm 15 with rollers 16 bears against the ring 14 and holds it in position while permitting the cut-out 13 with the pans 1 to rotate as the abrasive wheel 17 rotates. The samples 3 are then ground and polished to the proper degree by placing a suitable abrasive on the rotating abrasive wheel 17. The pans 1 containing the samples 3 can also be adapted to other types of automatic lapping machines.

70 When the samples 3 have been properly ground and polished the pans 1 containing the samples are removed from the cut-out 13 and the pans are then heated to melt the bedding material 2. The holder magnet 5 is preferably positioned over the pan 1 to hold the samples

3

3 during the remelting of the bedding material and to lift them free of the molten bedding material 2 for subsequent metallographic examination. The pan 1 and molten bedding material 2 are now ready to receive a new batch of samples and can be used over and over again.

Since all the sample faces 10 lie in a plane which is parallel to the abrasive wheel 17 the samples will all be ground uniformly and without any beveling of the sample faces 10.

The weight of the pan 1 and the bedding material 2 is usually sufficient to prevent any bouncing or "chattering" of the sample holder during the grinding and polishing operation. However, additional weights can be placed upon the pans 1 if desired.

It has been shown that by using my method, a man will be able to prepare and polish 8-10 times as many samples as had heretofore been possible in a given length of time.

As many embodiments of the invention are possible without departing from the scope thereof, it is to be understood that all matter set forth or shown in the accompanying drawings is to be interpreted as illustrative and not limiting.

I claim:

1. A method of mounting magnetic metallographic samples for the grinding thereof comprising:

(a) partially filling a shallow pan with a settable bedding material;

(b) placing a plurality of magnetic metallic samples against the flat face of a magnet;

(c) supporting said magnet above said settable bedding material with said samples at least partially embedded therein;

(d) causing said bedding material to set;

(e) separating said magnet from said samples.

2. The method according to claim 1 in which the settable bedding material is a metal alloy.

3. The method according to claim 1 in which the samples are a ferrous alloy.

4. A method of mounting magnetic metallographic samples for the grinding thereof comprising:

(a) partially filling a shallow pan with a bedding material;

(b) heating said pan to melt said bedding material;

(c) suspending a plurality of magnetic metallic samples from the flat face of a magnet;

(d) supporting said magnet above said settable bedding material with said samples at least partially immersed therein;

(e) cooling said pan to solidify said bedding material;

(f) removing said magnet from said pan containing the solidified bedding material and samples.

5. The method according to claim 4 in which the bedding material is a low melting point alloy.

6. The method according to claim 4 in which the samples are a ferrous alloy.

7. A method of mounting and grinding magnetic metallographic samples comprising:

(a) partially filling a shallow pan with a settable bedding material;

(b) placing a plurality of magnetic metallic samples against the flat face of a magnet;

(c) supporting said magnet above said settable bedding material with said samples at least partially embedded therein;

(d) causing said bedding material to set;

(e) separating said magnet from said samples;

(f) placing said pan containing the bedding material and samples against a rotating abrasive wheel;

(g) removing said pan containing said samples from the abrasive wheel;

(h) heating said pan to remelt said bedding material;

(i) replacing said magnet above said shallow pan and separating said samples from said bedding material.

8. The method according to claim 7 in which the settable bedding material is a low melting point alloy.

9. The method according to claim 7 in which the samples are a ferrous alloy.

References Cited in the file of this patent

UNITED STATES PATENTS

689,933	Underwood	Dec. 31, 1901
1,171,818	Walpole	Feb. 15, 1916
2,441,590	Ohl	May 18, 1948
2,539,513	Jenett	Jan. 30, 1951