March 22, 1955 H. P. GIFFORD 2,704,705

METHOD OF MAKING DIAMOND LAPS

Filed May 27, 1952

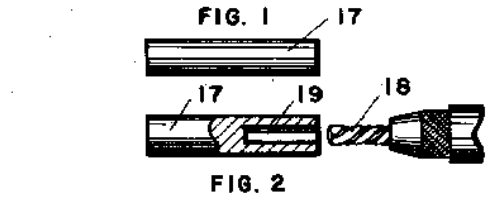
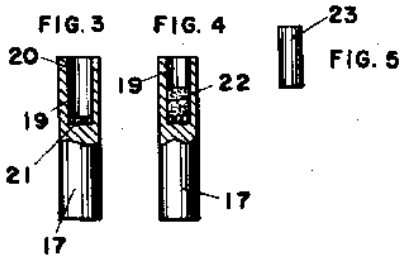
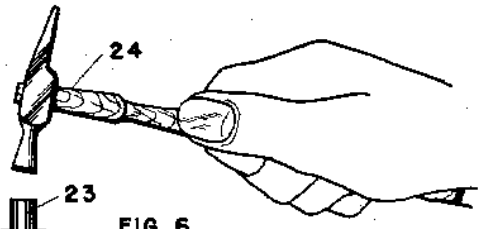


FIG. 2





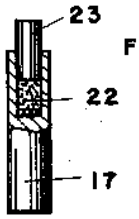


FIG. 6

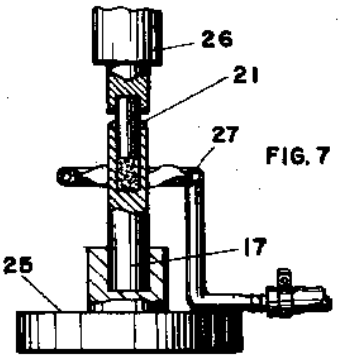


FIG. 7

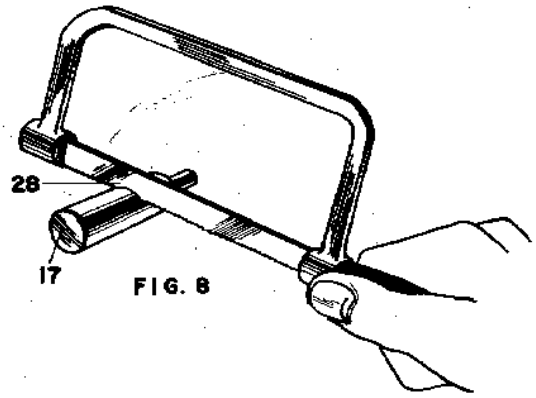


FIG. 8

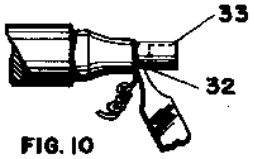


FIG. 10

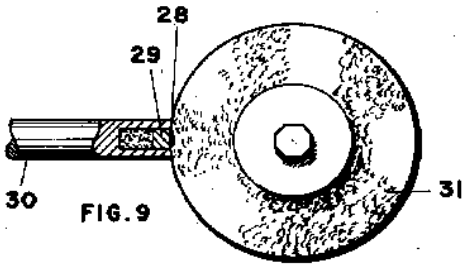


FIG. 9

FIG. 12

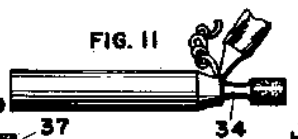


FIG. 11

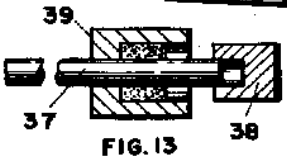


FIG. 13

FIG. 14

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METHOD OF MAKING DIAMOND LAPS

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Application May 27, 1952, Serial No. 290,181

1 Claim. (Cl. 51—293)

This invention relates to a method of making metal bonded diamond laps particularly of a diameter under ¼ of an inch.

The object of the present invention is to simplify the existing processes of manufacturing diamond laps and to make a lap which may be refreshed many times during its life.

A further object of the present invention is to provide a method of manufacturing a metal bonded diamond lap to provide a lap which has a solid core of mixed diamond abrasive and finely divided metallic particles. The various steps of the invention are diagrammatically illustrated in the several figures, in which;

Figure 1 is illustrative of a piece of cold rolled steel.

Figure 2 shows the first step of reaming a longitudinal hole in the steel.

Figure 3 illustrates the second step in which the interior of the hole is lined with flux.

Figure 4, the third step and illustrates the filling of the hole with a mixture of diamond powder and metal powder.

Figure 5 shows the punch which is turned to exactly fit the drilled hole.

Figure 6 shows the initial light tamping of the mixture in the hole.

Figure 7 illustrates the sixth step in the process in which the entire assembly is hot pressed.

Figure 8 shows the elimination of the top part of the steel and the punch by sawing.

Figure 9 shows the surfacing of the steel by a grinding wheel so that the end of the abrasive is exposed.

Figure 10 shows the turning away of the metal from the sides of the abrasive.

Figure 11 shows the undercutting of that portion of the metal adjacent the abrasive to provide clearance for the lap.

Figure 12 shows the finished lap here on a straight or tapered shank.

Figure 13 illustrates a modification in which a solid metallic core is shown without abrasive around the core.

Figure 14 shows the finished product, partly in section made in the modified form.

Referring to the figures, numerical rotation, a piece of cold rolled steel shown in Figure 1 at **17** is drilled by a drill **18** to provide a longitudinal bore **19**. This bore is made the exact size of the desired lap.

The interior of the bore **19** is coated with a flux **20** and powdered silver solder (Easy Flow Silver Solder #5, a purchased item) **21** is dropped to the bottom of the bore, after which the correct mixture **22** of diamond dust and metallic powder is poured into the bore to fill the bore approximately half full. This mixture of diamond dust and metallic powder is carefully screened for size, both for the diamond powder and for the metallic powder as this insures the coarseness or fineness of the finished product. The metallic powder may be of a number of various suitable alloys.

With the mixture **22** half filling the bore **20**, a punch **23** is turned to the exact size of the bore **20** and made sufficiently long to protrude from the bore after engaging the diamond mixture. The punch **23** is tapped by a light hand hammer **24** so that the mixture **22** is compact.

The piece of cold rolled steel together with the punch and the abrasive mixture is placed on a stand **25** and subjected to light pressure from a hydraulic press **26**. The abrasive mixture is brought to a temperature of approximately 1500° F. by means of a gas ring **27**, and the pressure from the hydraulic press **26** is increased to approximately 70,000 pounds per square inch. This sinters the mixture of powdered metal and diamond particles and affixes them firmly to the cold rolled steel **17**. The silver solder **21** adheres to the bottom **27** of the bore binding the molten abrasive mixture to the bottom and to the sides of the bore **19**, overflowing at the top to seal the punch to the cold rolled steel. The entire piece is then removed and sawed at a point just beyond the end of the abrasive mixture, leaving a small piece of the punch **29** in the bore. The entire end **30**, including both the punch and the sides of the bore, is dressed by a grinding wheel **31** until the abrasive is exposed, after which the side walls **32** of the bore enclosing the abrasive are turned away to expose the abrasive material, as shown at **33**. Referring to Figure **11**, that portion **34** of the cold rolled steel immediately behind the abrasive is cut away to provide clearance for the lap so that the finished product will look as shown in Figure 12 with a straight shank **35** or a tapered shank **36**, depending upon the chuck with which the tapered lap is to be used.

Referring to the modification shown in Figures 13 and 14, the bore has a central rod **37** extending throughout its length and the punch **38** fits around the rod to tamp the abrasive **39** in position. The process is carried out in the manner above described to form a lap **40**, as shown in Figure 14, having a central solid core formed of the rod **37**.

What is claimed is:

A method of making a diamond lap, consisting in boring a hole longitudinally of the steel rod of the exact diameter and twice the length of the desired abrasive portion of the lap, introducing solder into the bore thus formed and filling the bore slightly over half full with a homogeneous mixture of diamond powder and metallic powder, inserting a punch into the bore and tamping the powder, applying heat to a temperature of 1500° to fully sinter the mixture of diamond powder and metallic powder to form an abrasive section, subjecting said section to pressure 70,000 pounds per square inch while hot, removing the majority of said punch in that part of the rod which projects beyond the abrasive section, grinding the end of said rod including the punch until the abrasive section is exposed, turning the side of the bore from the abrasive section until said abrasive is exposed, and undercutting that portion of the steel rod directly connected to the abrasive section.

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