In one example, base **30** having a volume of 4.722 cubic inches and a weight of 1.336 lbs. was successfully joined to a tip **29** having a volume of 16.69 cubic inches and a weight of 4.723 lbs. using a 44,000 lb. axial load and a rotational speed of 2200 rpm.

As best shown in FIG. **2**, rotary cone cutter **11** may be formed by inertially welding base **30** with tip **29**. A circumferential flange or ridge **112** may be provided on the interior of base **30** to engage with recess **114** formed in the adjacent portion of tip **29**. Circumferential flange **112** cooperates with recess **114** to establish the desired alignment of base **30** with tip **29** during the inertial welding process. During later steps in the assembly of rotary cone cutter **11**, elastomeric seal **43** may be disposed within recess **114**.

FIGS. 4A–D show base portion **30**, **130**, **230** and **330** respectively which may be coupled with tip **29** as previously described to provide a composite cone cutter incorporating various alternative embodiments of the present invention. An important benefit of the present invention includes the ability to use same tip **29** with various base portions or backface rings. FIG. **4A** is an enlarged drawing showing base portion or backface ring **30** as previously described with respect to composite cone cutter **11**. Backface ring **30** includes opening **44** which is sized to be compatible with cavity **36** and to allow installation of spindle **23** within cavity **36** of associated cone cutter **11**. Layer **49** of the desired hard facing material is preferably disposed on the exterior of outer portion **33** to form backface **31**.

Backface ring **130** incorporating an alternative embodiment of the present invention is shown in FIG. **4B**. Outer portion **33** of backface ring **130** includes a plurality of generally cylindrical shaped inserts **132**. For one application, inserts **132** have a thickness or height of approximately 0.080". The thickness of inserts **132** is limited in part by the thickness of the associated matrix ring or steel core **32**. Inserts **132** may be formed from various types of material such as sintered carbide, thermally stable diamonds, diamond particles, or any of the other materials used to form layer **49**.

Backface ring **230** incorporating another alternative embodiment of the present invention is shown in FIG. **4C**. A plurality of inserts **232** are provided in outer portion **33** of backface ring **230**. Inserts **232** have a generally triangular cross-section as compared to the circular cross-section of inserts **132**. Otherwise, inserts **232** may be fabricated from the same materials as previously described with respect to insert **132**.

Backface ring **330** incorporating still another alternative embodiment of the present invention is shown in FIG. **4D**. A plurality of inserts **332** are provided in outer portion **33** of backface ring **330**. Inserts **332** may be natural diamonds and/or artificial diamonds which have been cast as an integral part of backface ring **330**. Inserts **342** represent smaller diamonds or diamond chips cast as an integral part of backface ring **330**. The present invention allows varying the size, location, and number of diamonds or diamond chips used to form outer portion **33** depending upon the intended use for the resulting rotary drill bit.

Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A method of manufacturing a rotary cone drill bit with a plurality of roller cone cutters with each cutter having a generally conical configuration and a composite cone body having a base with a backface formed of a hard material and a tip comprising the steps of:

constructing said base;

constructing said tip;

depositing a desired coating thickness of powdered metal on a low alloy steel core;

heating said steel core and said powdered metal together to bond said powdered metal with said steel core; and

joining together said previously constructed tip and base by inertial welding.

2. A method of manufacturing a rotary cone drill bit with a plurality of roller cone cutters with each cutter having a generally conical configuration and a composite cone body having a base with a backface formed of a hard material and a tip comprising the steps of:

constructing said base;

constructing said tip;

shaping a portion of a central core of steel to receive a layer of hard metal material;

forming said layer of hard metal material on said central core within said shaped portion; and

joining together said previously constructed tip and base by inertial welding.

3. A method of manufacturing a rotary cone drill bit with a plurality of roller cone cutters with each cutter having a generally conical configuration and a composite cone body having a base with a backface formed of a hard material and a tip comprising the steps of:

constructing said base;

constructing said tip;

forming a hard layer of metal material on said base;

forming a plurality of radial grooves in said layer of hard metal material; and

joining together said previously constructed tip and base by inertial welding.

4. A method of manufacturing a rotary cone drill bit having a plurality of roller cone cutters comprising the steps of:

forming each of said roller cone cutters from a cone body having a generally conical configuration including a base and a tip;

constructing said base with a backface formed from a hard material selected from the group consisting of tungsten carbide, nitrides, borides, carbon nitride, silicides of tungsten, niobium, vanadium, molybdenum, silicon, titanium, tantalum, hafnium, zirconium, chromium, boron, diamonds, diamond particles, or mixtures thereof;

constructing said tip; and

joining together said previously constructed tip and base by inertial welding.

5. The method of claim **4** wherein constructing said base further comprises the steps of:

depositing a desired coating thickness of powdered metal on a low alloy steel ring; and

heating said steel core and said powdered metal together to bond said powdered metal with said steel core.

6. The method of claim **4** further comprising the steps of:

shaping a portion of a steel core to receive a layer of hard metal material; and

forming said layer of hard metal material on said core within said shaped portion.