Dec. 20, 1927. 1,653,022

L. SCHMIDT

APPARATUS FOR THE PRODUCTION OF ARTIFICIAL JEWELS OR PRECIOUS STONES

Filed Oct. 10, 1925

Fig.1.

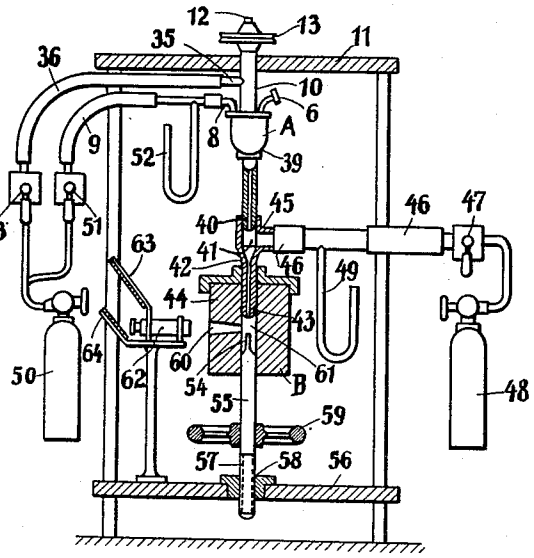


Fig.2.

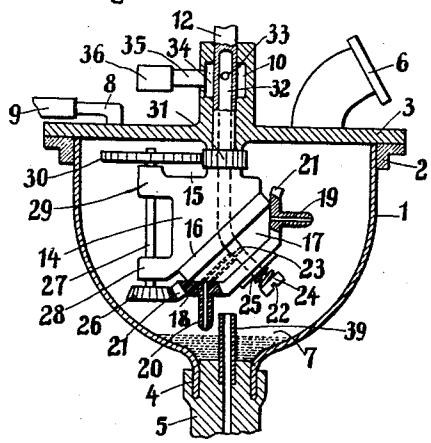


Fig.3.

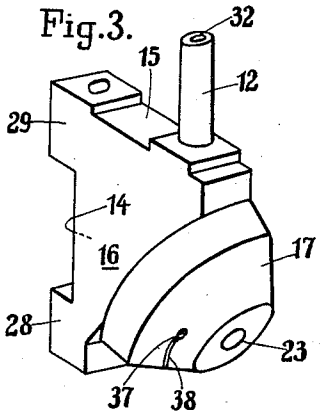


Fig.4.

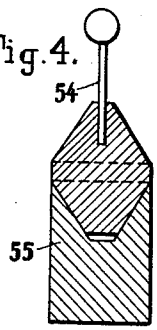


Fig.5.

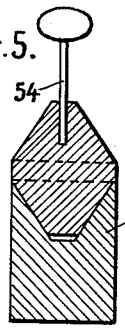


Fig.6.

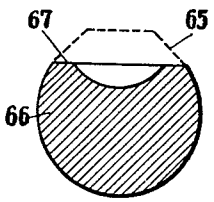
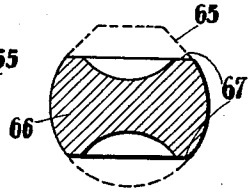


Fig.7.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE PRODUCTION OF ARTIFICIAL JEWELS OR PRECIOUS STONES.

Application filed October 10, 1925, Serial No. 61,860, and in Germany July 12, 1924.

My invention relates to improvements in apparatus for the production of artificial jewels or precious stones and in particular to the manufacture of small beads consisting of precious stones of such quality that by grinding cup-shaped cavities into them they may be converted into foot or step bearings for the pivots of the spindles of electrical measuring instruments and the like.

My invention is an improved device for producing fused globules of highly refractory material and of utilizing a known method which consists in pouring the pulverized raw material of artificial jewels, viz, pulverized aluminium oxide with or without an addition of a staining metal oxide, upon the point of a supporting pin that is swept by a fusing flame. A drop of fused precious stone mass forms on the end of the pin and solidifies into a solid bead when the fusing flame is removed. My apparatus is, however, so constructed that the beads thus produced are free from certain flaws or faults frequently found in beads of similar material.

In such stone beads, hollow spaces are generally found. The spaces are caused by extremely small enclosed gas bubbles Such bubbles are frequently present in large numbers and they appear to the naked eye as a cloud in the otherwise clear and transparent mass. The beads which do not contain an excessive number of such bubbles are suitable for jewelry but are useless for bearing jewels. A further imperfection in the ordinary artificially-fused beads of precious stone material is the tendency to crack, and, furthermore, the neck portion of the bead which is attached to the supporting pin is large in size and is chemically polluted with the material of the supporting pin. Such chemical pollution results, as a rule, in very porous neck portions. Owing to the large size of the neck portion and the necessity of removing the same in the further treatment of the bead, a considerable waste of valuable raw material resulted.

In order to obtain beads free from defects, I utilize in my apparatus an "atomizer" for the purpose of preparing the raw material for fusion. In conjunction with the "atomizer", I utilize a new form of pin for supporting and collecting the fused drop. I produce a mist or a suspension of the raw material in a gas in the atomizer chamber and then conduct the suspended particles into a fusing chamber in a current of gas. Instead of a clay or copper wire supporting pin, I utilize a rod of oxide of copper or a rod of aluminium oxide. The latter is produced by annealing an extruded rod of aluminium hydroxide. I am thus able to reduce the diameter of the supporting pin from the customary diameter of 3 mm. to as small as 1 mm. and less.

By employing the atomizer, I am enabled to supply only the very finest individual particles of the material to the gas stream and, therefore, the particles which are conveyed by the gas stream to the fused drop are prevented from balling together into small lumps. Each particle coming in contact with the fused drop will thus be embedded into the fused mass without introducing a small quantity of gas into the mass. I thereby prevent irregular aggregates of particles and inclusions of gas in the interstices of such aggregates and thereby prevent the introduction of gas into the fused globule.

By utilizing the specified supporting pin, I obtain various advantages. The neck portion of the fused bead is only slightly polluted with foreign matter and, consequently, only a small portion of the bead is wasted when the bead is removed. Except for the neck portion, the fused bead assumes a fairly accurately formed spherical or lenticular shape of predetermined size. The shape and size of the bead renders it possible to insert the whole bead, with a minimum of prior special treatment, directly into the metal structures where they are utilized for jewels or bearing surfaces.

In the drawings constituting a part hereof in which like numerals designate like parts,

Fig. 1 is a diagrammatic view of my apparatus, showing portions thereof in cross section,

Fig. 2 is an elevational view of the atomizer, showing portions thereof in cross section,

Fig. 3 is a view of the portion of the atomizer in perspective,

Fig. 4 is an elevational view of the supporting pin, showing a spherical bead thereon and a holder in longitudinal cross section,

Fig. 5 is an elevational view of a supporting pin and a lenticular bead, and a holder in longitudinal cross section,

Fig. 6 is a view, in cross section, of a spherical jewel provided with a cup shaped bearing surface for the reception of a spindle pivot, and

Fig. 7 is a view, in cross section, of a spherical jewel showing two depressions for the reception of the spindle pivot.

The atomizer A consists of a glass bell 1 suspended from a supporting ring 2 and closed by cover 3. The lower end or apex is formed into a flange 4 which is cemented into a pipe 5. A cover 3 is provided with an inlet pipe 6 through which pulverized aluminium oxide 7 is introduced into the bell 1. The cover is also provided with a gas inlet 8 which is connected to a gas conduit 9 and also with a bearing member 10 which is attached to the cross arm 11 of a supporting frame.

The bearing member 10 is provided with a longitudinal opening in which the spindle 12 is fitted. The spindle 12 is provided, at its upper end, with a pulley wheel 13 and, at its lower end, within the bell 1, with the atomizer proper.

The atomizer proper consists of a prismatically shaped gear train support 14 having a spindle 12 rigidly attached to one side 15 thereof. On another side 16 of the gear train support 14 is a frusto-conically shaped member 17 attached in such a manner that the axis thereof forms an angle of 45° with the axis of the spindle 12. A disc shaped nozzle wheel 18 is rotatably associated with the frusto-conically shaped member 17 and is provided with diametrically opposite nozzles 19 and 20 attached thereto in such manner as to form an angle of 45° with the axis of the cone. The disc shaped member 18 is operatively retained on the bearing member 17 by means of a washer 25 and a spring 24 which are held in place by a screw 23 in the end of an opening 23 in the bearing member.

A bevelled gear 21 in the nozzle wheel 18 is adapted to mesh with the bevel pinion 26 and the latter is rigidly attached to one end of a spindle 27. The spindle 27 is journalled in the lugs 28 and 29 of the member 14 and it carries, at its upper end, a spur gear 30 which, in turn, is adapted to mesh with a pinion 31 rigidly attached to the cover 3 of the atomizer bell.

An opening 32 in the spindle 12 communicates, at its upper end, with an opening 34 in the cover member 10 by means of an opening in the wall of spindle 12. A pipe 35 is adapted to convey oxygen through a conduit 36 which leads to a pressure supply of said gas. The opening 32 in the spindle 12 communicates with a transverse opening 23 in the cone member 17. From the opening 23, another opening leads to the outside of the cone 17 and communicates with a groove which extends around the lower half of the conical member 17. The groove 38 and openings in the nozzles 19 and 20 are located in the same plane with respect to the axis of the bearing 17.

In operation, the supply of oxygen gas is conducted, under pressure, through the conduit 36 into the cavity 34, transverse opening 33 and the spindle-conduit 32. From thence, the gas flows to openings 23 and 37 and to groove 38, and from thence, into one or the other of nozzles 19 or 20, depending upon the relative position of the nozzles with respect to groove 38.

As shown in Fig. 2, the gas issues from nozzle 20 as a fine jet against the pile of pulverized raw material 7 which is heaped in the bottom of bell 1 and thereby the material is stirred into a dust cloud. The spindle 12 is rotated by means of a motor, not shown. Operatively connected thereto is the pulley 13 which turns spindle 12 and body 14, thereby actuating the pinion 30 and bevelled gears 26 and 21. The rotation of the spindle 12 and body 14 therefore causes the nozzles 19 and 20 to rotate in the atomizer bell around the axis of the bearing member 17. Through the agency of the gear wheels 30, 31, 26 and 21, the dish-shaped nozzle member 18 and the nozzles attached thereto are simultaneously rotated upon the bearing member 17. By reason of the rotation of member 14 on the axis of spindle 12 and the rotation of member 18 on the axis of member 17, the nozzles trace a vermicular path in the atomizer shell. The nozzles being operative one at a time with respect to the gas, act to project a jet of gas against the heaped up raw material 7 and into the gas space in the atomizer thereby producing and maintaining a suspension of solid particles in the gas.

From the atomizer 1, a conduit 39 conducts the suspended particles and gas away from the atomizer. The end of the conduit 39 projects into the atomizer chamber, thereby preventing the pile of solid particles from being blown directly into the conduit. The conduit 39 communicates with the central opening in pipe 5 which terminates in a nozzle 40 in a conical cavity or mixing chamber 41. The chamber 41 opens into another nozzle member 42 which terminates, at its lower end 43, in the reaction chamber 61 which is formed in a block 44 composed of chamotte or other refractory material.

The mixing chamber 41 is connected to a pressure supply of gas 48 through a valve 47 and conduits 45 and 46. The gas tank 48 is filled with a combustible gas, such as

hydrogen or illuminating gas, and the pressure with which this gas is supplied through chamber 41 is regulated by the pressure gauge 49.

The oxygen for the atomizer and for the fusing flame is supplied to the opening 34 from a container 50 through a valve 53 and conduits 36 and 35. A branch pipe from the gas tank 50 leads to a valve 51 which is connected to the atomizer through the cover 3 by means of conduit 9 and connector 8. The pressure of the gas supplied to the atomizer is regulated by a pressure gauge 52.

A copper rod 55, provided with a pin 54 at its upper end, is inserted in the combustion chamber 61 and is supported on the frame 56. The rod 55 is adapted to be raised and lowered by means of screw threads 57 and a nut 58 on the frame work 56. The pin may be turned by means of a hand wheel 59.

For the purpose of observing the process, the refractory block is provided with an opening 60 leading into the fusing chamber 61. In front of the opening 60, a microscope 62 is mounted. The microscope may be utilized for directly observing the development of the fused bead or for projecting a view of the same on a mirror 64 and screen 63.

In operation, a supply of oxygen, under pressure, is conducted into the atomizer bell 1 from the conduit 9, and from thence, through conduits 39 and 40, together with the fine particles of aluminium oxide which are continuously whirled up to the level of the opening of the pipe 39. The mixture of oxygen and finely divided aluminium oxide dust flows from the nozzle 40 into the chamber 41 where it is mixed with the combustible gas from tank 48. The mixture of oxygen, combustible gas and finely divided oxide flows through the pipe 42 and nozzle 43 into the chamber 61 where the gas mixture is ignited. The aluminium oxide dust collects on the pin 54 and forms a fused globule of aluminium oxide thereon. The currents of gas are so regulated that the pressure gauge 52 indicates a predetermined excess pressure over the pressure in gauge 49.

The shape of the fused bead may be influenced by regulating the gas pressure, particularly the pressure of the oxygen gas as indicated by guage 52. A low gas pressure produces a fairly accurately formed spherical bead as shown in Fig. 4 and a relatively high oxygen gas pressure froms a somewhat flattened lenticularly-shaped bead as shown in Fig. 5. In order to produce as accurately shaped spherical beads as possible, the process must be interrupted at a predetermined time. If such time is exceeded, the drop continues to build up cylindrically in a vertical direction. In order to obtain fused globules of a definite size and shape, and desired contour of the globule may be traced upon the observation screen 63, and the process may be interrupted at the moment that the fused globule corresponds to the form on the screen.

It is possible to utilize the atomized aluminium oxide in this apparatus and to form fused beads of the same with other combustible gases. For the latter process, hydrogen is not necessary, as ordinary illuminating gas may be employed in lieu thereof.

Further treatment of the beads for forming jewels for the pivots of electrical meters comprises grinding away the neck portion of the fused bead and forming a flat surface 67 on the bead. A depression in the flattened surface, as shown in Fig. 6, is then made. The jewel illustrated in Fig. 7 is finished on both sides in a similar manner. The jewel shown in Fig. 7 may be used in one position or until one of the faces is roughened through use and then reversed, thereby utilizing the opposite face for the bearing surface.

Although my invention comprises means for atomizing finely divided aluminium dust by means of nozzles which are operated within a stationary atomizer bell, it will be understood that the stationary bell may be made movable and may be kept in motion during the operation of the apparatus. Other modifications of my invention will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is defined in the annexed claims.

I claim as my invention:—

1. An apparatus for the manufacture of artificial jewels, comprising, in combination, a hollow body of refractory material, a pin extending into the cavity of said body, means for producing a gas-flame in said cavity whereby said flame is caused to flow around said pin and a pneumatic device for applying separately suspended particles of pulverized aluminium oxide to the point of said pin, said device comprising a container for providing a supply of compressed gas, a chamber adapted to contain a suspension of pulverized solid aluminium oxide, rotatable means within said chamber for producing said suspension in said chamber and pipes for connecting said chamber with said container of compressed gas and with the cavity of said refractory body.

2. An apparatus for the manufacture of artificial jewels comprising, in combination, a hollow body of refractory material, a pin extending into the cavity of said body, means for producing a gas-flame in said cavity whereby said flame is caused to flow around said pin and a pneumatic device for applying separately suspended particles of pulverized aluminium oxide to the point of said pin, said device including a container

for providing a supply of compressed oxygen gas, a chamber adapted to contain a suspension of pulverized solid aluminium oxide, rotatable means within said chamber for producing said suspension in said chamber and pipes for connecting said chamber with said container of compressed oxygen gas and with the cavity of said refractory body.

3. An apparatus for the manufacture of artificial jewels, comprising, in combination, a hollow body of refractory material, a pin extending into the cavity of said body, means for producing a gas-flame in said cavity whereby said flame is caused to flow around said pin and a pneumatic device for applying pulverized aluminium oxide to the point of said pin, said device comprising a container for providing a supply of compressed gas, a chamber adapted to retain in its lower part a store of pulverized aluminium oxide and in its upper part a suspension of pulverized aluminium oxide in said gas, a blow-pipe in said chamber adapted to direct a portion of said gas towards the surface of said store of aluminium oxide, a conduit for connecting said blow-pipe with said container of compressed gas, a conduit connected to the upper part of said chamber for supplying another portion of said gas and means in the lower part of said chamber for providing communication with the cavity in said refractory body.

4. An apparatus for the manufacture of artificial jewels, comprising, in combination, a hollow body of refractory material, a pin extending into the cavity of said body, means for producing a gas-flame in said cavity whereby said flame is caused to flow around said pin and a pneumatic device for applying particles of pulverized aluminium oxide to the point of said pin, said device including means for providing a supply of compressed gas, a chamber adapted to contain in its lower part a store of pulverized aluminium oxide and in its upper part a suspension of pulverized aluminium oxide in said gas, a blow-pipe located in said chamber and adapted to direct a vermiculate jet of a portion of said supply of gas towards the surface of said store of aluminium oxide, a conduit for communicating with said blow-pipe and with said supply of compressed gas, a conduit communicating with the upper part of said chamber and with said supply of gas and a conduit adapted to communicate with the upper part of said chamber and with the cavity in said refractory body.

5. An apparatus for the manufacture of artificial jewels, comprising, in combination, a hollow body of refractory material, a pin extending into the cavity of said body, means for producing a gas-flame in said cavity, means in said refractory body whereby said flame is caused to flow around said pin and a pneumatic device for applying particles of aluminium oxide to the point of said pin, said device comprising means for providing a supply of compressed gas, a chamber adapted to contain in its lower part a store of solid pulverized aluminium oxide and in its upper part a suspension of pulverized aluminium oxide, a blow-pipe in said chamber provided with nozzle means, said means being movable in such manner that a nozzle is successively directed at different portions of said store of aluminium oxide in said chamber, means for moving said nozzle in a vermiculate path, a conduit for connecting said blow-pipe with said gas supply and means in said chamber adapted to conduct said suspension to the cavity in said refractory body.

6. An apparatus for the manufacture of artificial jewels, comprising, in combination, a hollow body of refractory material, a pin which at least at its point is not thicker than 1 mm. and extending into the cavity of said refractory body, means for producing a gas flame in said cavity, means in said refractory body whereby said flame is caused to flow around said pin and a pneumatic device for applying particles of aluminium oxide to the point of said pin, said device comprising means for providing a supply of compressed gas, a chamber adapted to contain a suspension of pulverized aluminium oxide, rotatable means within said chamber for producing said suspension in said chamber and pipes for connecting said chamber with said supply of gas and with the cavity of said refractory body.

7. An apparatus for the manufacture of artificial jewels, comprising, in combination, a hollow body of refractory material, a copper pin which at least at its point is not thicker than 1 mm. and extending into the cavity of said refractory body, means for producing a gas flame in said cavity, means in said body whereby said flame is caused to flow around said pin and a pneumatic device for applying pulverized aluminium oxide to the point of said pin, said device comprising means for providing a supply of compressed gas, a chamber adapted to contain a mist of pulverized aluminium oxide, rotatable means within said chamber for producing said mist in said chamber and pipes for connecting said chamber with said supply of compressed gas and with the cavity of said refractory body.

8. An apparatus for making a fused globular mass of material which comprises a refractory combustion chamber, a pin extending into said chamber for collecting said globule, means for separating solid unfused particles of said material and for maintaining a suspension of the same in a gas and a receptacle for momentarily retarding said suspension and disseminating another gas throughout said suspension.

9. An apparatus for the manufacture of artificial jewels, comprising, in combination, a hollow body of refractory material, a pin extending into the cavity of said body, means for producing a gas-flame in said cavity whereby said flame is caused to flow around said pin and a pneumatic device for applying pulverized aluminum oxide to the point of said pin, said device comprising a container for providing a supply of compressed gas, a chamber adapted to retain in its lower part a store of pulverized aluminium oxide and in its upper part a suspension of pulverized aluminium oxide in said gas, a blow-pipe in said chamber adapted to direct a portion of said gas towards the surface of said store of aluminium oxide, a conduit for connecting said blow-pipe with said container of compressed gas, a conduit connected to the upper part of said chamber for supplying another portion of said gas and means in the lower part of said chamber for providing communication with the cavity in said refractory body.

10. In a device for fusing powdered material, the combination with a combustion nozzle member and a mixer, of means for producing a suspension of said material in gas which comprises a container having a rotatable spindle mounted on one wall thereof, said spindle having an opening extending thoughout a portion of its length and adapted to communicate with an external supply of gas, a gear train support mounted on said spindle, said support having an opening therein co-extensive with the opening in said spindle, a bearing member on said body having its axis inclined at an angle to the axis of said spindle and having an axial, a transverse and a slotted opening therein in communication with the opening in said spindle, a nozzle support mounted on said bearing member, nozzles mounted on said nozzle support to communicate with the slotted opening in said bearing member during a portion of a turn of said nozzle support, a stationary pinion on a wall of said container and positioned concentrically with respect to said spindle, geared means in said nozzle member and a plurality of driving gears mounted on said gear train support to co-act with said stationary pinion and said nozzle support, whereby said nozzles are caused to trace a vermiculate path in said container when the spindle is turned.

11. In an apparatus for making artificial jewels, the combination with a combustion chamber having means for collecting fused-disseminated particles of refractory material, means for momentarily retarding and then accelerating a suspension of said refractory material in a gas and for mixing another gas therewith, of an atomizer for providing said suspension, said atomizer including a plurality of nozzles rotatably mounted on a support and means for rotating said support and for propelling said nozzles in a circuitous path.

In testimony whereof I affix my signature.

LUDWIG SCHMIDT.