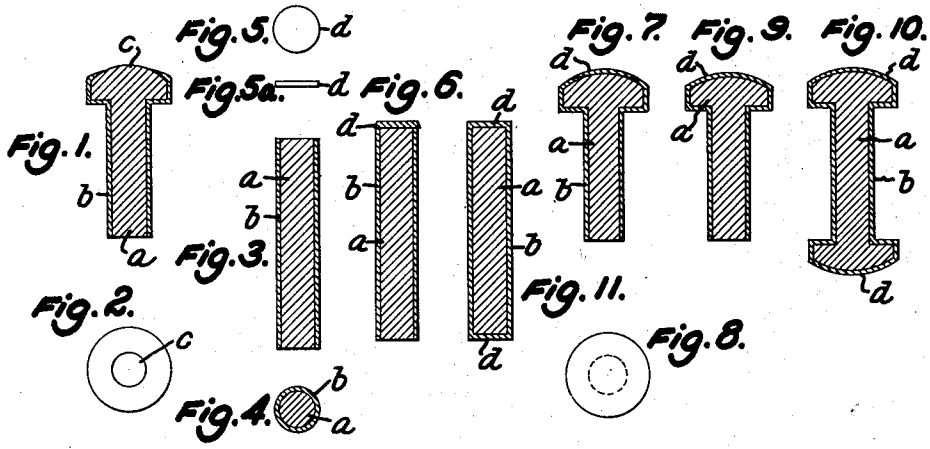
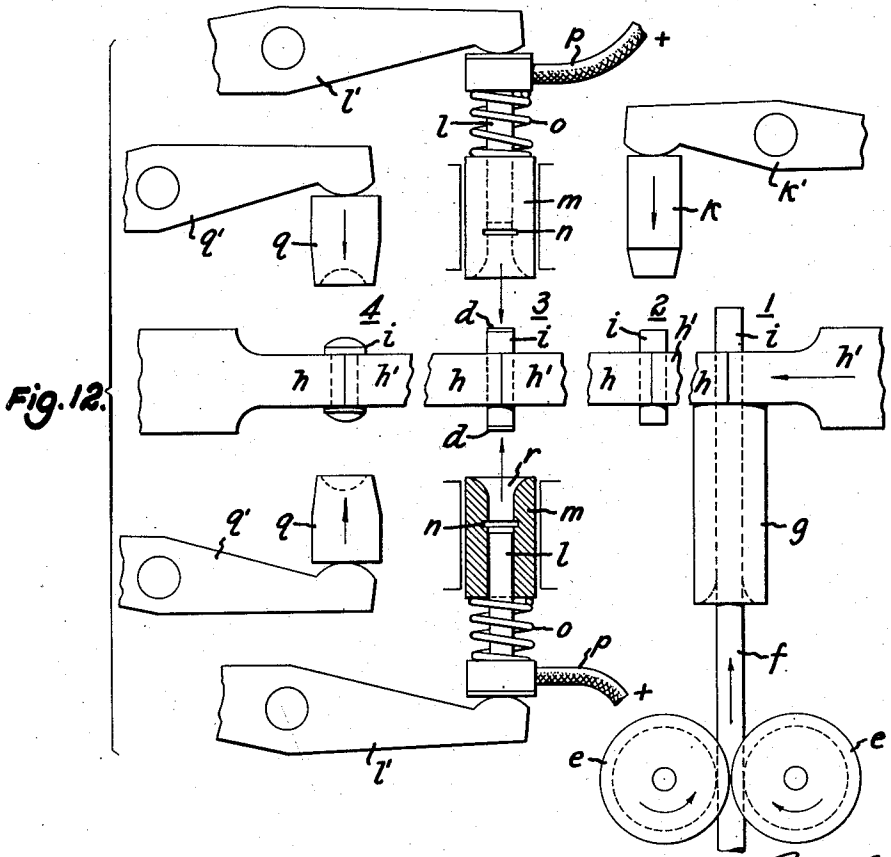
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METHOD OF PROTECTING CUT SURFACES OF PIECES OF WIRE

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METHOD OF PROTECTING CUT SURFACES OF PIECES OF WIRE

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This invention relates to a method of protecting cut surfaces of pieces of wire, for example the cut surfaces of so-called dental pins, used to secure artificial teeth, which are made by cutting up wires or the like consisting of a core of base metal and a coating of noble metal and which are deformed, if desired, at the end or ends, for example by forming heads by upsetting.

When such wires are cut up into pins, the base core metal is bared at the cut surfaces and thus exposed to corrosive influences, for example to the influence of the juices of the mouth in the case of pins for artificial teeth. It is true that when the wire employed for the production of such pins is cut through the coating metal is generally drawn slightly over the end surface of the wire, but even when the coating is thick it does not extend sufficiently far to cover the cut surface of the core metal completely. The disadvantages of the exposed base core metal occur to an increased extent when the dental pins are provided at one or both ends in the usual manner with a broadened head, by upsetting, since the exposed cut surface of the base metal of the core is thereby also enlarged.

Various attempts have already been made to obviate this drawback. For example, it has been proposed to provide the entire pin with a further electrolytic coating after the pin has been given its final shape, i. e. after the head has been upset on the pin. Thus, in order to obtain a dental pin the core metal of which is covered by a protective layer of noble metal on every surface, the pin is coated with two or more layers of noble metal. This process is complicated and expensive, since two or more coatings exist on the greatest part of the surface of the pin, where a single coat would be sufficient.

It has already been attempted to cap over the cut surface by dissolving out the base core metal with acid, to a suitable depth, and then bending over the remaining shell of noble metal. Moreover attempts have been made to cover the cut by soldering with a noble metal solder, or, when upsetting the head, to press the end of the composite wire to a point, in order thus to draw the shell of noble metal entirely over the core metal. Finally, it has also been proposed to protect the cuts by applying a galvanic coating. These proposals, however, have been found in practice to be inadequate or unreliable.

It has been ascertained that reliable protection of the base metal exposed at the cut surfaces of wires, dental pins and the like, against corrosive influences of every kind, can be obtained by pressing on to the cut surface of the pin cut from the wire a small plate of a corrosion-resistant metal or corrosion-resistant alloy, and only then effecting the further deformation of the end face of the pin. The union of the metal applied in the form of a small plate with the core metal may be effected before the deformation for example, by welding. It has further been found that even by simply pressing the plate on to the cut surface it is possible to achieve firm adhesion of the plate to the end surface, and this adhesion can be still further improved by a diffusion welding of the plate to the shell of noble metal of the composite wire occurring on subsequent heating, for example by heating in an atmosphere free from oxygen.

The process of the present invention is very simple and therefore reliable. Plates of noble metal of any desired thickness can be applied to the end surfaces of the pin, so that even in the case of very extensive deformation of the end of the pin, the core metal remains covered. Factory production of the pins of the present invention can take place entirely satisfactorily.

Corrosion-resistant metals of the most diverse nature, particularly precious metals, such as gold, platinum, palladium or other metals of the platinum group, silver, and the like, or alloys containing such metals, may be used as material for the protective plates, depending on requirements. The plates may also comprise two or more alloys one above the other.

The manufacture of the pins of the present invention advantageously takes place in a single apparatus in which the several successive operations are automatically coupled together. The pins cut from the wire are held by clamping means and continuously fed to the device for pressing on the small plate and then to the upsetting device. The small protective plate can, in this arrangement, be stamped by a die out of a strip of metal continuously passed through a slit in the guide sleeve of the die, and, by the same die, be simultaneously pressed against the wire end on the further forward movement of said die, while, if desired, it may be electrically welded with the aid of the die, acting as electrode.

Examples of construction of dental pins for artificial teeth, to be provided and already provided with protective plates, in accordance with the invention, at the cut surfaces, without and with upset head and with upset heads at both ends, are illustrated by way of example on an enlarged scale in Figs. 1 to 11 of the accompany-

ing drawing, while Fig. 12 diagrammatically illustrates the production of such pins, including cutting off from a longer wire, application and welding-on of the protective plate and subsequent upsetting of heads at the ends of the wire.

Figs. 1 and 2 show a longitudinal section and plan-view, respectively, of a dental pin provided at one end with an upset head, of the type hitherto known, wherein the core *a* of base metal, provided with a coating of noble metal *b* is bared at *c* in the centre of the head.

Fig. 3 shows a longitudinal section of an anchor pin with a core *a* of base metal and a protective coating *b* consisting of a noble metal or layers of noble metals.

Fig. 4 shows a cross-section of the same pin, while Fig. 5 shows in plan and Fig. 5*a* shows in elevation a protective disc *d* suitable for covering the cut surfaces of this pin.

Fig. 6 shows a longitudinal section of the same pin after the protective disc *d* has been mounted on one end.

Figs. 7 and 8 show a longitudinal section and plan view respectively of a pin furnished with a head by upsetting, the upsetting having been effected only after application of a protective disc *d* in the manner shown in Fig. 6.

Fig. 9 shows a pin of the same type, in which the protective disc *d* has been homogeneously united with the coating of noble metal, for example before upsetting the head, by heating, for example by electric welding.

Fig. 10 shows such a pin having at both ends heads furnished with protective discs.

Fig. 11 shows a longitudinal section of a pin, not furnished with heads but with protective discs *d* mounted on both ends, after the welding.

In Fig. 12, *h* and *h'* denote tools, which in the first operation, indicated at **1** in Fig. 12, grip between themselves the wire *f*, guided from below upwards by a sleeve *g* under the action of the rolls *e*, after it has passed out of said sleeve *g* and thereupon cut off the portion *i* of the wire projecting above the sleeve *g* by sliding from right to left (viewed in the plane of the drawing).

In the second operation, shown at **2**, the piece of wire *i* gripped between the ends of said tools *h* and *h'*, if it is to be provided with protective discs at both ends, is displaced, by means of the die *k* operated by the lever *k'*, so far in position between the clamping members *h* and *h'* that it projects approximately equal distances on both sides of said members.

In the third operation, shown at **3**, the protective discs *d* are applied at both ends of the piece of wire clamped between the ends of the tools *h* and *h'*, by means of a die *l* guided in the sleeve *m* and of the same diameter as the discs *d*, in the following manner.

n is a slit in the sleeve *m*, through which is constantly passed a band (not shown in the drawing) of the material used to make the discs. After the pin *i* has been brought, by sliding the tools *h* and *h'*, above the mouth of the guide sleeve *m* which is flared outwardly in funnel form, a small disc *d*, corresponding with the cross-sectional shape of the wire, e. g. circular, is stamped out of the metal band and guided on to the pin *i* by the forward movement of the die *l*, which at first is held back under the action of the pressure of the spring *o* on the other side of the slit *n* or of the metal band guided through said slit, under the action of the lever *l'*, while at the same time the sleeve *m* is moved forward in the direction of said pin until, approximately at point *r*, the small disc *d* comes into contact with the cut surface of the pin *i* and, under the action of the die *l*, is pressed against said cut surface.

When the aforedescribed apparatus is also used for welding the protective disc to the pin by electrical means, the die *l* is connected in the manner illustrated in the drawing, by way of the lead *p*, with one terminal of the transformer (not shown) the other terminal of which is connected to frame. Suitable wiring ensures that the circuit is closed for a moment after the small disc has been pressed on to the pin, the current heat occurring effecting the welding.

In the drawing are shown the parts needed, in this process, for stamping out the protective discs, for pressing them on to and welding them to the ends of the pin, for both ends of the pin. However in cases where a protective disc is to be provided only at one end of the pin, such devices may naturally be used only at one end. In such cases the second operation hereinbefore referred to and illustrated in Fig. 12 is also generally dispensed with.

In the fourth operation, indicated at **4** in Fig. 12, heads are upset on the pin *i*, which has now been guided still further to the left between the tools *h* and *h'*, by means of the dies *q*, under the action of the levers *q'*. In this operation also, upsetting devices of the type illustrated in the drawing may, if desired, act only at one side, on one end of the pin *i*.

I claim:

1. Process for the manufacture of dental pins and the like from a uniform wire consisting of a core of base metal and a coating of corrosion-resistant metal cut into pieces of predetermined length having said base metal core exposed at the ends thereof which comprises pressing into cohesive contact with the exposed core and coating of a cut end of said piece a plate of corrosion-resistant metal substantially co-extensive with said cut end to form a capped end portion having a continuous corrosion-resistant metal coating, and thereafter upsetting said capped end portion of the piece while maintaining the continuity of said coating to form an expanded anchor portion having a base metal core and a continuous corrosion-resistant coating.

2. Process for the manufacture of dental pins and the like from a uniform wire consisting of a core of base metal and a coating of corrosion-resistant metal cut into pieces of predetermined length having said base metal core exposed at the ends thereof which comprises pressing into cohesive contact with the exposed core and coating of a cut end of said piece a plate of corrosion-resistant metal substantially co-extensive with said cut end to form a capped end portion having a continuous corrosion-resistant metal coating, heating said end portion to effect welding between said plate and said exposed core and coating, and thereafter upsetting said capped end portion of the piece while maintaining the continuity of said coating to form an expanded anchor portion having a base metal core and a continuous corrosion-resistant coating.

3. Process for the manufacture of dental pins and the like from a uniform wire consisting of a core of base metal and a coating of precious metal cut into pieces of predetermined length having said base metal core exposed at the ends thereof which comprises pressing into cohesive contact with the exposed core and coating of a

cut end of said piece a plate of precious metal substantially co-extensive with said cut end to form a capped end portion having a continuous precious metal coating, and thereafter upsetting said capped end portion of the piece while maintaining the continuity of said coating to form an expanded anchor portion having a base metal core and a continuous corrosion-resistant precious metal coating.

4. Process for the manufacture of dental pins and the like from a uniform wire consisting of a core of base metal and a coating of precious metal cut into pieces of predetermined length having said base metal core exposed at the ends thereof which comprises pressing into cohesive contact with the exposed core and coating of a cut end of said piece a plate of precious metal substantially co-extensive with said cut end to form a capped end portion having a continuous precious metal coating, heating said end portion to effect welding between said plate and said exposed core and coating, and thereafter upsetting said capped end portion of the piece while maintaining the continuity of said coating to form an expanded anchor portion having a base metal core and a continuous corrosion-resistant precious metal coating.

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