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1,978,516

X-RAY TARGET

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Fig. 1

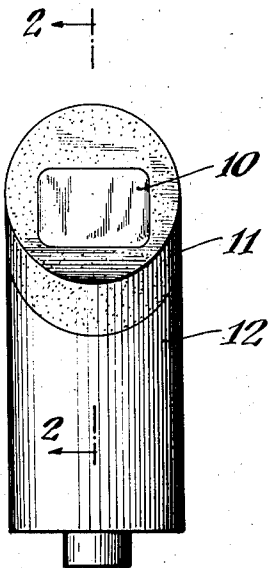


Fig. 2

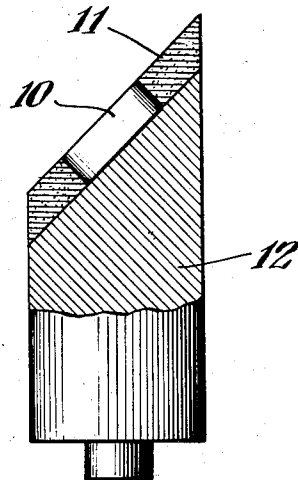
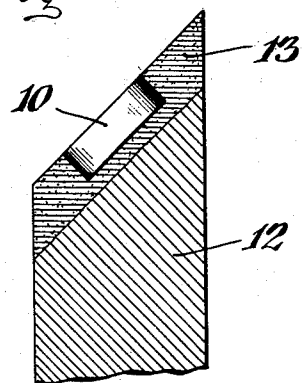


Fig. 3



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X-RAY TARGET

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8 Claims. (Cl. 250—35)

This invention relates to X-ray targets and, more particularly, to X-ray targets having an active surface of tungsten or molybdenum and a main body of highly conductive metallic material such as copper.

It has for a general object the provision of such an X-ray target which will give efficient service under operating conditions with a substantial reduction in the usual tendency in service of the metal adjacent the refractory metal forming an active surface and the refractory metal itself to crack and separate from each other.

A more specific object of the invention is the provision of such an X-ray target having a body of tungsten or molybdenum forming an active surface thereof, with at least the sides thereof surrounded by and joined to a composition of tungsten or molybdenum with a highly conductive metallic material, such as copper, which in turn is joined to a main body of highly conductive metallic material such as copper, to substantially reduce the usual tendency of the metal adjacent the body of tungsten or molybdenum and the body of tungsten or molybdenum itself to crack and separate from each other, and obtain greater efficiency and a longer service life.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises an article of manufacture possessing the features, properties, and the relation of elements which will be exemplified in the article hereinafter described and the scope of the invention of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 depicts a front elevational view of the X-ray target of the present invention;

Fig. 2 depicts a side elevational view with parts in section of one form of the present invention; and

Fig. 3 depicts a side elevational view with parts broken away of another form of the present invention.

Prior to the present invention a common type of X-ray target consisted of a main body of copper in a face of which was set a body of tungsten which provided the active surface of the target as disclosed in the patent to Coolidge, No. 1,162,341, of November 30, 1915. Due to the wide difference of coefficient of expansion of the

copper and tungsten, in operation cracks soon developed in the copper adjacent the body of tungsten accompanied by a separation of the copper and tungsten and a frequent appearance of cracks in the tungsten body itself.

These and other difficulties of the prior art are substantially reduced by the present invention which briefly consists of the provision of a composition of tungsten or molybdenum and a highly conductive metallic material such as copper surrounding and joined to at least the sides of the body of tungsten or molybdenum and to which the main body of the target is joined. This composition may be formed in a known manner as that described in the Adams Patent No. 1,552,184 of September 1, 1925, or the Gillette Patent No. 1,539,810 of May 26, 1925.

A tungsten body of a requisite shape, depending upon the focal point desired, may be surrounded in a die by a mixture of particles of tungsten and copper, the mixture pressed to form a slug, and the resultant slug sintered in a vacuum or reducing or inert atmosphere furnace. A main body of copper is then joined to the tungsten-copper composition in the furnace, preferably by the well known method of casting.

The X-ray target of the present invention may also be formed by pressing and sintering a mixture of particles of tungsten and copper to form a body of desired shape having a hole or recess therein. A tungsten body is then placed in the hole or recess and joined to the tungsten-copper composition and the main body of copper joined thereto preferably at the same time by the well known method of casting in a furnace.

The tungsten-copper composition preferably consists of between about 50 per cent and 80 per cent by weight of tungsten and a remainder chiefly of copper.

Referring to the drawing, Figs. 1 and 2 depict one form of X-ray target which embodies the present invention. A body 10 of tungsten of desired shape is surrounded by and joined to the body 11 of tungsten-copper composition to form a composite element in turn joined to a main body of copper 12 in the manner described above.

Another form of the invention is depicted in Fig. 3 wherein the X-ray target is formed from a body 13 of tungsten-copper composition provided with a recess in which is set the tungsten body 10. The usual main body of copper 12 is joined to the back of the body 13 of tungsten-copper composition.

Since the tungsten-copper composition has a

density which is less than that of tungsten and greater than that of copper and a coefficient of expansion which lies between that of tungsten and that of copper, there is less tendency in operation for the material adjacent the tungsten body to crack and separate therefrom. X-ray targets of the present invention have been operated under similar conditions and for longer periods of time as compared with X-ray targets having a body of copper in which is set a tungsten body, without any indication of the formation of cracks or the separation of the elements of the X-ray target.

Molybdenum may be substituted for the tungsten. When molybdenum is used for the active surface it is preferably surrounded by a composition of molybdenum and a highly conductive metallic material such as copper. The present invention also contemplates the use of highly conductive metallic materials other than copper for the main body and as an ingredient of the surrounding composition. Such highly conductive metallic materials are preferably alloys of copper and of silver. In these modifications it is preferable to use as an ingredient of the surrounding composition the same highly conductive metallic material as is used to form the main body of the target and to use as the other ingredient of the surrounding composition the same refractory metal used to form the active surface of the target.

It will thus be seen that the objects set forth above are efficiently attained by the present invention.

Since certain changes may be made in the above article and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. An X-ray target comprising a body of one of the refractory metals tungsten and molybdenum, a composition of one of said refractory metals with a highly conductive metallic material surrounding and joined to at least the sides of said body, and a cast main body of highly conductive metallic material having a face joined to said surrounding composition and covered beyond the margins of said body of refractory metal by said composition.

2. An X-ray target comprising a body of one of the refractory metals tungsten and molybdenum, a composition of the selected refractory metal with a highly conductive metallic ma-

terial surrounding and joined to at least the sides of said body, and a cast main body of the same highly conductive metallic material having a face joined to said surrounding composition and covered beyond the margins of said body of refractory metal by said composition. 80

3. An X-ray target comprising a body of tungsten, a composition of tungsten and copper surrounding and joined to at least the sides of said tungsten body, and a cast main body of copper having a face joined to said tungsten-copper composition and covered beyond the margins of said tungsten body by said composition. 85

4. An X-ray target comprising a body of one of the refractory metals tungsten and molybdenum, a body of a composition of the selected refractory metal with a highly conductive metallic material surrounding and joined to the sides of said refractory metal body, and a cast body of the same highly conductive metallic material having a face joined to and covered by said composition body and said body of refractory metal. 90

5. An X-ray target comprising a body of tungsten, a body of tungsten-copper composition surrounding and joined to the sides of said tungsten body, and a cast main body of copper having a face joined to and covered by said body of tungsten-copper composition and said tungsten body. 95

6. An X-ray target comprising a body of one of the refractory metals tungsten and molybdenum, a body of a composition of the selected refractory metal with a highly conductive metallic material having a recess therein in which said refractory metal body is set with the faces thereof adjacent the walls of the recess joined thereto, and a cast body of the same highly conductive metallic material having a face joined to and covered by said composition body. 100

7. An X-ray target comprising a body of tungsten, a body of tungsten-copper composition having a recess therein in which said tungsten body is set with the faces thereof adjacent the walls of the recess joined thereto, and a cast body of copper having a face joined to and covered by said body of tungsten-copper composition. 105

8. An X-ray target comprising a body of tungsten, a composition of between about 50 per cent and 80 per cent tungsten and the balance chiefly of copper surrounding and joined to at least the sides of said tungsten body, and a cast body of copper having a face joined to said tungsten-copper composition and covered beyond the margins of said tungsten body by said composition. 110

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