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X-RAY IMAGE INTENSIFIER TUBE WITH MAGNETICALLY  
SHIELDING MOUNTING SLEEVE SECURED TO ENVELOPE  
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Fig. 1

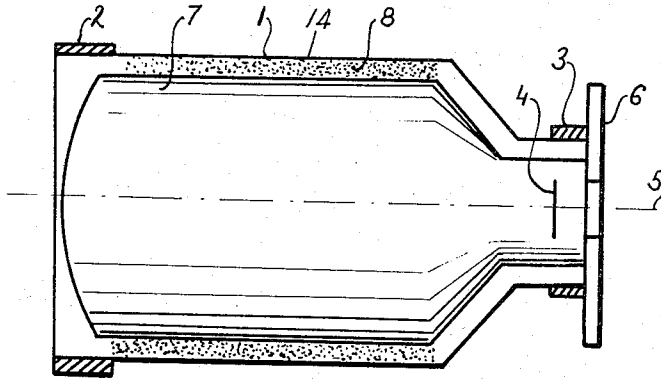
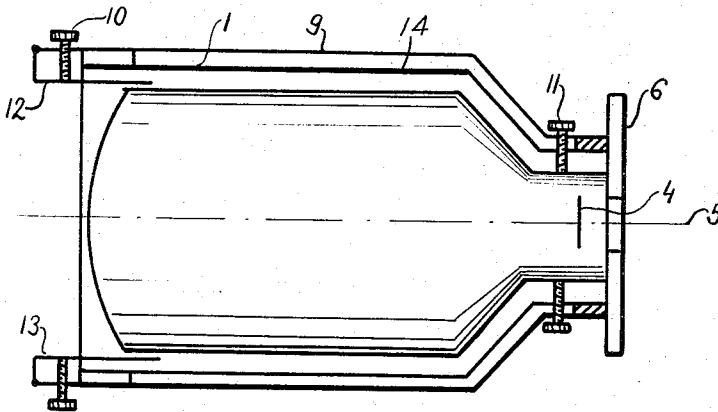


Fig. 2



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## 3,377,504 X-RAY IMAGE INTENSIFIER TUBE WITH MAGNETICALLY SHIELDING MOUNTING SLEEVE SECURED TO ENVELOPE

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4 Claims. (Cl. 315—85)

### ABSTRACT OF THE DISCLOSURE

An X-ray intensifier tube, upon being placed in an adjusting sleeve which surrounds the tube, is properly adjusted in its position within the sleeve. The sleeve and the tube are inseparably united and thus form a unit which is much easier exchangeable and adjustable as the tube alone. When the unit is introduced in a housing no adjustment of the tube is needed. Means on the outside of the sleeve suffice to properly locate the unit within the housing.

The invention relates to a supporting arrangement for an X-ray image intensifier tube, enabling exact adjustment of the position of the tube.

For the correct function of an X-ray image intensifier it is necessary to position the X-ray image intensifier tube in its housing very precisely. It is necessary to ensure image centricity on the output screen, perpendicularity of the image plane with respect to the optical axis, and to adjust precisely the image plane on the output to the image plane of the optics used. Such adjustment must be especially precise for a high speed lens with a small depth of focus. This is a necessary requirement for the exchangeability of individual instruments for observation and recording.

Up to now the adjustment of the X-ray image intensifier tubes, especially of the all-glass designs without a sleeve, was carried out by means of a circular clamping ring by screws in a glass seal on the X-ray image intensifier tube. With respect to the reference image plane the perpendicularity of the X-ray image intensifier tube was adjusted by means of three adjustable stops. However, the referred to known adjustment means required special glass metal seals. It is also known to place an X-ray image intensifier tube in an intensifier housing and fix the tube in its adjusted position by means of springs and felt. The disadvantage of known designs is that they do not permit permanent adjustments of centricity and planparallelism. After exchange of an X-ray image intensifier tube new adjustments must be made. Such adjustment is very complicated and cannot be carried out without special instruments, e.g., equipment for measuring reflection angles, etc. in the X-ray working position. Therefore, adjustments cannot be made on the working site. Instead, the adjustment must be carried out in the plant.

The present invention eliminates the referred to disadvantages by the fact that the tube is permanently central and planparallel in an adjusting sleeve. The tube is delivered with the adjusting sleeve as an exchangeable spare unit to replace an X-ray image intensifier tube. There is no need any longer for adjusting the conditions of the X-ray working position by means of special instruments.

The invention will be best understood from the following specification to be read in conjunction with the accompanying drawings in which:

FIG. 1 is a longitudinal sectional view of a mount-

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ing structure according to the invention for an X-ray image intensifier tube, whereas FIG. 2 is an elevation of the unit of FIG. 1 within a housing.

An adjusting sleeve 14 according to the invention consists of a cylindrical part 1, made from metal, plastics, or from a combination of both of these materials. The sleeve is lined on its inside with a magnetically shielding material (not shown), e.g., permalloy. At the ends and on the outer face of the sleeve are fixing members 2, 3 by means of which the adjusting sleeve bears precisely against the internal walls of a housing. The external contour of adjusting sleeve is similar to that of the internal contour of the housing of an X-ray image intensifier tube 7.

6 is a reference plane member 4, in an output screen, and 8 is a non-hygroscopic material resistant to X-ray radiation and ensuring a mechanically solid, yet a sufficiently elastic joint between the adjusting sleeve 14 and the X-ray image intensifier tube 7. The material 8 may be, for instance,

- (a) glass wool compacted by polyester resin;
- (b) wool compacted by a solution of cellon in chloroform;
- (c) polymerizing material cured after having been cast between the X-ray image intensifier tube and the adjusting sleeve.

The axis of sleeve 14 is designated 5.

The adjustment of the X-ray image intensifier tube 7 in the adjusting sleeve 14 is carried out in such a way that the adjusting sleeve with the X-ray image intensifier tube 7 is pushed into a housing 9 (see FIG. 2) for centering and focusing. By means of screws 10, 11 and strips 12, 13 the following settings of the unit 7, 14 and thus of the X-ray image intensifier tube 7 is made:

- (a) image centricity on the output screen 4 with respect to the axis 5 of the adjusting sleeve 14,
- (b) planparallelism of the image plane with respect to the reference plane 6,
- (c) distance of the image plane from the reference plane 6.

After finishing the adjustment, the gap between the adjusting sleeve 14 and the bulb of the X-ray image intensifier tube 7 is filled with non-hygroscopic material 8 resistant to X-ray radiation and which ensures a mechanically solid, yet a sufficiently elastic joint between the adjusting sleeve and the X-ray image intensifier tube.

The adjusting sleeve 14 together with the X-ray image tube 7 form after adjustment and, for instance curving of the material 8 a solid unit which may be replaced in whichever image intensifier housing of the same type without any additional adjustment on the working position. The replacement is fast, simple and the X-ray image intensifier tube is precisely adjusted.

From the foregoing it will be seen that the present invention also includes a method of adjusting the position of an X-ray intensifier tube within a housing by adjusting the position of the tube in the adjusting sleeve.

What I claim is:

1. A mounting unit for an X-ray image intensifier tube, said tube having an output screen in its interior and a cylindrical wall portion, comprising
  - (a) an adjusting sleeve, a portion of said sleeve being cylindrical and surrounding said cylindrical wall portion, there being an annular gap between said cylindrical wall portion and said cylindrical sleeve portion,
  - (1) said sleeve being magnetically shielding,
  - (b) a reference plane member outside, and fixed to adjacent ends, of said tube and said sleeve,
  - (c) a filler within said gap, inseparably uniting said

tube and said sleeve in proper relation with respect to each other and thus forming a properly adjusted tube-sleeve unit, and

(d) means on the outside of said sleeve for accurately fixing said unit to a housing receiving said unit.

2. In the structure according to claim 1, a lining of magnetically shielding material on the inner face of said sleeve.

3. In the structure according to claim 1, said unit-fixing means including two spacedly arranged rings.

4. In the structure according to claim 1, said filler being constituted by a non-hygroscopic material resistant to X-ray radiation, and solid yet sufficiently elastic.

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