

May 22, 1962

H. J. MURPHY

3,036,145

TUBE SHIELD AND FASTENING MEANS FOR TUBE SHIELD

Filed July 13, 1956

3 Sheets-Sheet 1

Fig. 1.

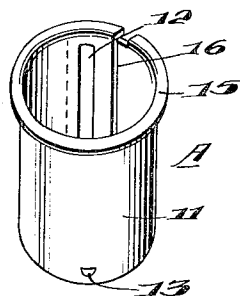


Fig. 2.

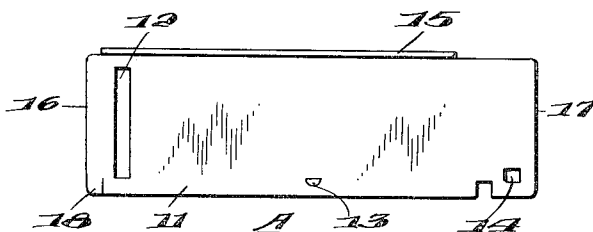


Fig. 3.

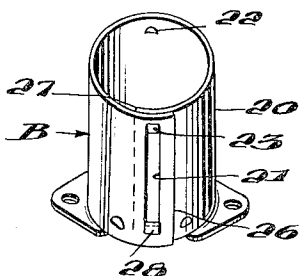


Fig. 4.

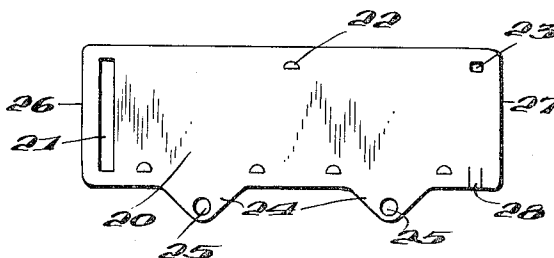


Fig. 5.

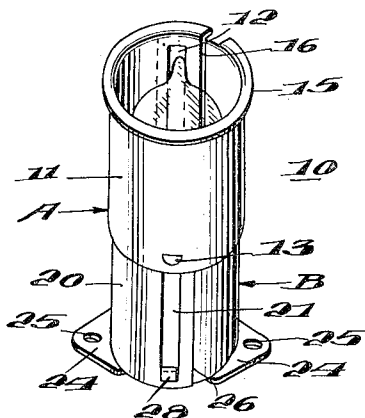
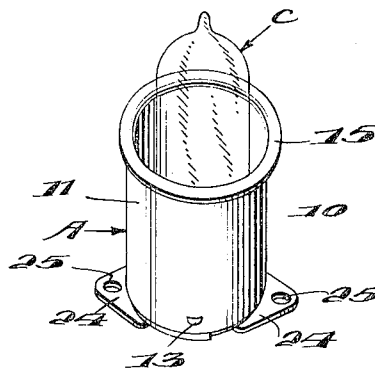


Fig. 6.



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Fig. 7.

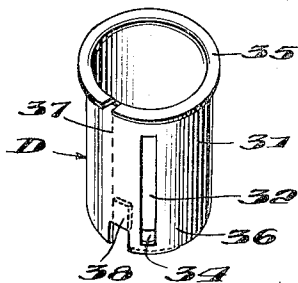


Fig. 8.

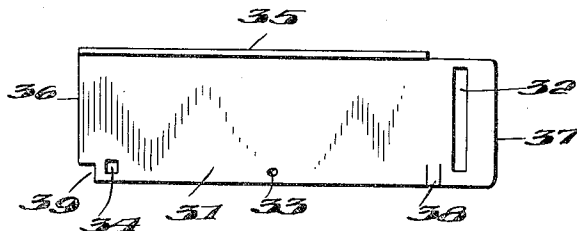


Fig. 9.

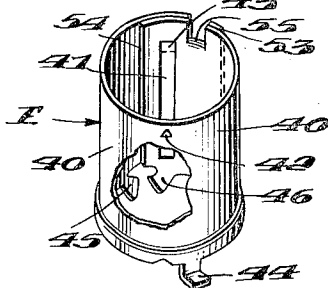


Fig. 10.

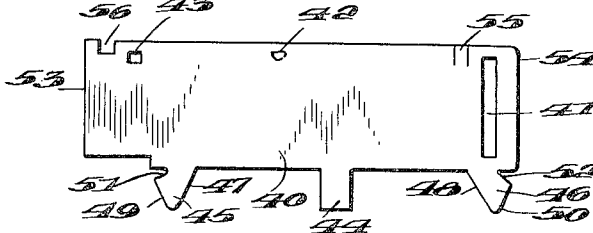


Fig. 11.

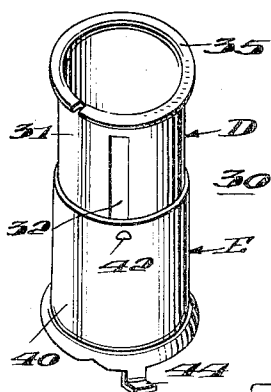


Fig. 12.

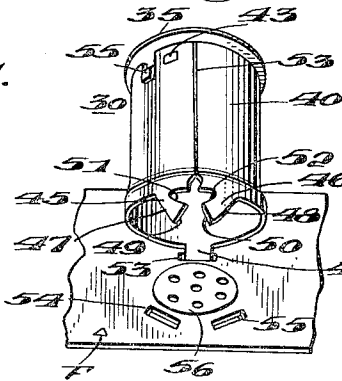


Fig. 13.

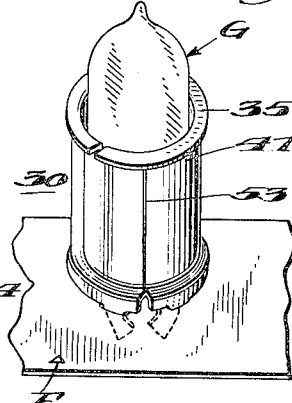
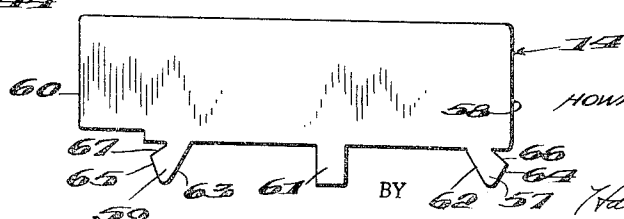


Fig. 14.



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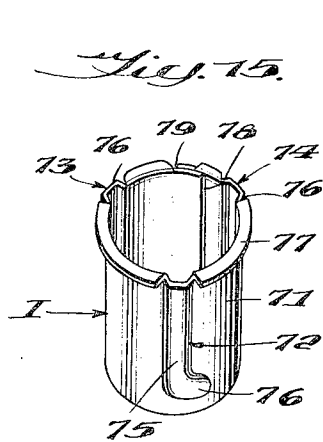
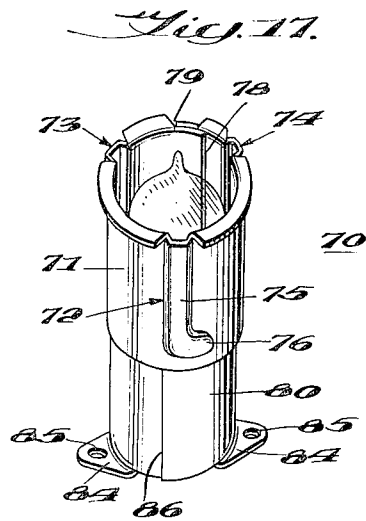
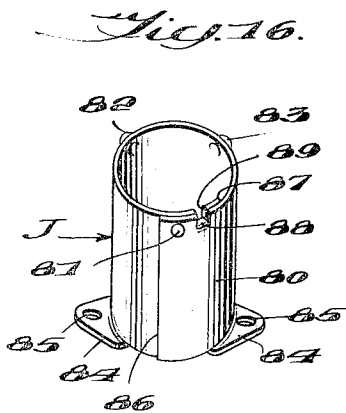
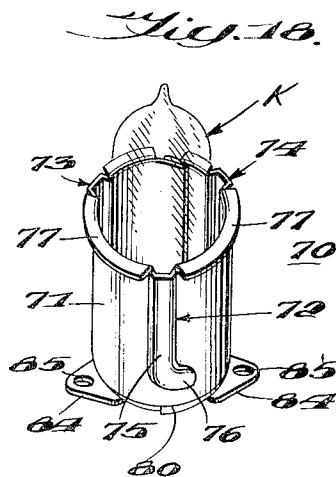
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TUBE SHIELD AND FASTENING MEANS FOR TUBE SHIELD

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3 Sheets-Sheet 3



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TUBE SHIELD AND FASTENING MEANS FOR TUBE SHIELD

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8 Claims. (Cl. 174—35)

The present invention relates to improved electrical shield constructions, and more particularly to improved tube shield constructions for association with electron discharge tubes or the like in electrical apparatus to avoid undesirable reactions between the various elements thereof, and to new and improved attaching means for securing such tube shield constructions to a support.

A wide variety of shielding means, generally identified as tube shields, have been employed heretofore in electrical apparatus, such as, for example, radio sets, to dissipate electro-magnetic and electrostatic fields set up therein by the electron discharge tubes during the operation of the apparatus. While such prior tube shields adequately perform their intended shielding function, such tube shields have possessed many disadvantages which have been found objectionable.

One of the most common forms of tube shields heretofore employed has consisted of a simple can or cylinder which is secured to the chassis in detachable relationship therewith by a friction fit or similar fastening means. When a tube is to be replaced in an apparatus employing the so-called can type tube shield, the tube shield is completely detached from the chassis of the apparatus, after which the tube is then replaced. Oftentimes the repairman or technician performing the operation will fail to replace the tube shield, with a corresponding impairment in the operation of the apparatus. Moreover, the failure to replace the tube shield invariably results in the tube shield being left on the chassis, thereby resulting in the likelihood of a short circuiting of the electrical apparatus. Another disadvantage with the can type tube shield is that the continued insertion and withdrawal of the tube shield from time to time during the replacement results in a loose connection between the tube shield and the chassis. This will result in a vibration of the shield, oftentimes not insuring a positive grounding of the shield to the chassis.

Another detachable form of the tube shield that has received widespread usage is the so-called shaped shield. This type consists of two symmetrically paired parts of sheet metal and shaped to fit closely to the bulb of the tube. The paired parts are held together by a detachable ring, a detachable collar, or various other forms of clamping and connecting parts. Such shaped tube shields, in addition to the basic disadvantages attendant to detachable tube shields in general, suffer further in that all tubes are not one size. Therefore, several different sizes must be made and stocked, resulting in an unnecessary inventory. Moreover, the design and multiplicity of parts of the shaped tube shields have resulted in a relatively high cost for such shields.

Some attempts have been made to eliminate these disadvantages attendant to the various forms of detachable tube shields fixedly securing the tube shields to the chassis. Such fixed tube shield constructions have consisted of two mating or paired parts, each of which are hingedly connected at their bottom ends to one another or to the chassis. To replace a tube in an electrical apparatus employing such a construction, each of the mating parts is pivoted upwardly away from one another, the tube then replaced, and the component parts then pivoted inwardly to one another to envelope and shield the new tube. A principal disadvantage with this type of tube shield is that

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it is extravagant of chassis space and does not permit the positioning of the tubes to the manufacturer's requirements. Another disadvantage with this form of shield is that latching or connecting means between the mating parts to insure proper engagement of the shield parts must be present, thereby increasing the complexity and cost of such tube shields. Therefore, the permanently affixed tube shields heretofore developed have met with very little success since compactness of design and simplicity of construction are necessities in most electrical apparatus.

It is therefore a principal object in the elimination of the foregoing and related disadvantages to provide a new and novel tube shield construction overcoming the disadvantages attendant to previously employed tube shields.

Another object of the present invention is to provide a new and novel tube shield construction which will remain fixed to the support at all times.

Another object of the present invention is the provision of an improved tube shield construction which will permit replacement of a tube more easily than with prior tube shields.

Yet another object of the present invention is the provision of an improved tube shield construction which will be permanently affixed to the chassis, thereby insuring the proper functioning of the tube shield at all times.

A further object of the present invention is the provision of an improved tube shield construction that requires a minimum amount of chassis space.

A still further object of the present invention is the provision of an improved tube shield construction in which the component parts will be in proper engagement with one another at all times.

Yet another object of the present invention is to provide a tube shield construction having new and improved fastening means for securing same to a support which will eliminate the possibility of any accidental removal of the shield construction.

Another object of the present invention is the provision of an improved tube shield construction that will remain in tight engagement and in proper grounded relationship with the chassis at all times.

A still further object of the present invention is the provision of an improved tube shield construction that is of extreme simplicity in design and operation, and inexpensive to manufacture.

Other and additional objects will become apparent from the ensuing description taken in conjunction with the accompanying drawings.

Broadly stated, in the attainment of the foregoing and related advantages, the tube shield construction of the present invention comprises inner and outer sleeve means, one of said sleeve means having securing means positioned at one end thereof for securing same to a chassis in fixed relationship thereto, the other of said sleeve means being axially movable relative to the fixed sleeve means, each of said sleeve means being provided with complementary guide means and locking means to insure the axial movement and locking of said movable sleeve means with respect to the fixed sleeve means.

Broadly stated, the connecting means for securing the tube shield construction to the chassis and made in accordance with the present invention comprises a tubular sleeve means, and connecting means secured to the bottom edge of said sleeve means in spaced relation to one another, said connecting means being circumferentially flexible with respect to one another to permit the entry thereof into a slot on a support.

To the accomplishment of the foregoing and related ends, the present invention then consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawing and the following description setting forth in detail certain means in the carry-

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ing out of the invention, such disclosed means illustrating, however, but one of various ways in which the principle of the invention may be employed.

The present invention is illustrated by way of example in the accompanying drawings, in which:

FIGURE 1 is a perspective view of the sleeve means forming one component part of the tube shield construction made in accordance with the present invention.

FIGURE 2 is a top plan view of a blank to be employed in forming the sleeve means shown in FIGURE 1.

FIGURE 3 is a perspective view of the sleeve means forming the second component part of the tube shield construction made in accordance with the present invention which is to be associated with the sleeve means shown in FIGURE 1.

FIGURE 4 is a top plan view of a metal blank to be employed in forming the sleeve means shown in FIGURE 3.

FIGURE 5 is a perspective view of a tube shield construction made in accordance with the present invention illustrating the association of the sleeve means as shown in FIGURES 1 and 3.

FIGURE 6 is a perspective view of the tube shield construction shown in FIGURE 5, in which the tube shield construction is in position to permit the removal or replacement of an electron discharge tube.

FIGURE 7 is a perspective view of sleeve means to be employed in another form of a tube shield construction made in accordance with the present invention.

FIGURE 8 is a top plan view of a metal blank to be employed in forming the sleeve means shown in FIGURE 7.

FIGURE 9 is a perspective view of sleeve means for forming a component part which is to be associated with the sleeve means shown in FIGURE 7 to form the tube shield construction made in accordance with the present invention.

FIGURE 10 is a top plan view of a metal blank to be employed in forming the sleeve means shown in FIG. 9, and which further illustrate the new and novel securing means.

FIGURE 11 is a perspective view of another form of the tube shield construction made in accordance with the present invention illustrating the association of the sleeve means shown in FIGURES 7 and 9 to provide the desired shielding.

FIGURE 12 is a perspective view illustrating the securing of the sleeve means shown in FIGURE 9 to a support.

FIGURE 13 is a perspective view of another form of a tube shield construction as shown in FIGURE 11, in which the tube shield construction is in a position to permit the replacement of a tube therein.

FIGURE 14 is a top plan view of a metal blank to be employed in forming sleeve means which illustrate the new and novel securing means made in accordance with the present invention.

FIGURE 15 is a perspective view of sleeve means forming a component part in still another form of a tube shield construction made in accordance with the present invention.

FIGURE 16 is a perspective view of a second sleeve means to be associated with the sleeve means shown in FIGURE 15 to form the tube socket construction made in accordance with the present invention.

FIGURE 17 is a perspective view of another form of a tube shield construction made in accordance with the present invention illustrating the association of the sleeve means shown in FIGURES 15 and 16 to provide the desired shielding of the electron discharge tube.

FIGURE 18 is a perspective view of the electron discharge tube shown in FIGURE 17, in which the tube shield construction is in a lower position to permit the replacement of the tube.

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Referring now to the drawings, and with particular reference to FIGURES 1-6, an illustrative embodiment of one form of a tube shield construction made in accordance with the present invention and generally designated by reference numeral 10 is shown. The tube shield construction 10 as shown comprises an outer tubular sleeve member A and an inner tubular sleeve member B, each of which are provided with complementary guide means to permit relative axial or longitudinal movement with respect to one another.

The outer tubular sleeve member A as shown in FIGURES 1 and 2 constitutes the movable member of the tube shield construction 10, and is of a diameter sufficient to permit the placement of an electron discharge tube therein and of a height less than that of such tube. In general, the height will be such as to permit the easy grasping of a tube placed therein in a manner to be described more fully hereinafter. The outer sleeve member A comprises a tubular body portion 11 having a longitudinally extending slot 12 formed therein, the slot 12 terminating just short of the top and bottom ends thereof and being accessible thereto only from the inside of the body portion 11. The body portion 11 is provided adjacent its lower end with flexible locking means 13 which extend inwardly for a distance greater than the thickness of the wall of the body portion 11, and which is substantially diametrically opposed with respect to the slot 12. A small opening 14 of a width corresponding to that of the slot 12 is present in the body portion 11 which in conjunction with the slot 12 and locking means 13 will function with complementary parts of the inner sleeve member B to retain the members in operable relationship and insure either the raising, locking, or lowering of the outer sleeve member A in a manner to be described more fully hereinafter. An outwardly extending peripheral flange portion 15 is secured to the top free end of the body portion 11 to provide reinforcement thereto and to facilitate the axial movement thereof.

The outer sleeve member A may be made from any suitable metal that is capable of possessing some degree of flexibility and yet will possess sufficient strength to resist bending or distortion. The outer sleeve member A may be made in any desired manner and preferably, as is shown in FIG. 2, is formed from a flat blank of sheet metal which is rolled to the required diameter with the free ends 16 and 17 of the body portion 11 overlapping one another. The rolled ends of the sheet metal blank may be held in place by providing a foldable tab 18 at the bottom end of the blank immediately adjacent the elongated slot 12 which will engage the cutout portion 19 provided on the opposite bottom end of the blank inwardly from the opening 14, and be foldable upwardly with respect thereto. In this manner the free ends 16 and 17 will be held in locked overlapping relationship thereby maintaining the desired diameter. In the sheet metal blank shown in FIGURE 2, the longitudinal slot 12 is immediately adjacent the end 16 with the small opening 14 being immediately adjacent the lower portion of the opposite lower end 17 of the blank with the locking means 13 which is preferably in the form of a struck barb disposed intermediate therebetween adjacent the bottom edge thereof. Thus when the ends 16 and 17 of the sheet metal blank are rolled toward one another, end 17 overlaps end 16 with the hole 14 and slot 12 being in alignment with one another, with the remaining portion of the slot 12 being longitudinally overlapped thereby permitting entry thereto only from within the body portion 11. The locking means 13 will be diametrically opposite the slot 12 adjacent the bottom end of the outer sleeve member A, and will extend inwardly therefrom.

The inner tubular sleeve member B, as shown in FIGURES 3 and 4, constitutes the fixed member of the tube shield construction 10, and is of a diameter sufficient to permit the placement of an electron discharge tube therein, and of a height less than that of such tube. In general,

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the height of the inner sleeve member B will be such that the combined length of both the inner and outer sleeve members A and B when in association with one another will be greater than the height of the electron discharge tube when fixed on a support. Similarly, the diameter of the inner sleeve member B should be just slightly less than that of the outer sleeve member A so as to permit the outer sleeve member A to be in operable engagement therewith and yet be actually movable with respect thereto without creating unnecessary distortional strains.

The inner sleeve member B comprises a tubular body portion 20 having a longitudinally extending slot 21 formed therein, the slot 21 terminating just short of the top and bottom ends thereof and being accessible thereto only from the outside of the body portion 20. In general, the slot 21 will be of substantially the same dimensions as the slot 12 of the outer tubular sleeve member A. The body portion 20 is provided adjacent its upper end with an outwardly extending flexible locking means 22 extending outwardly for a distance greater than the thickness of the wall of the body portion 20, and which is substantially diametrically opposed with respect to the slot 21. A small opening 23 of a width corresponding to that of the slot 21 is provided in the body portion 20 immediately adjacent its upper end and in alignment with the slot 21. In general, the inner sleeve member B and outer sleeve member A will possess substantially the same general dimensions and configuration with each having several complementary common parts, although in a reverse position.

The slot 21, locking means 22, and opening 23 positioned on the upper end of the inner sleeve member B correspond and are in operable relationship with the slot 12, locking means 13, and opening 14 positioned on the lower end of the outer sleeve member A to insure the retention of the sleeve members A and B in operable association, and to permit either the raising, locking, or lowering of the outer sleeve member A in a manner to be more fully described hereinafter in the association of the component members to form the tube shield construction 10. The lower end of the inner sleeve member B is provided with opposed connecting lugs 24 having an opening 25 therein and extending outwardly from either side of the body portion 20 to fixedly secure the inner sleeve member B to a base or other support by means of screws, bolts, or the like.

The inner sleeve member B may be made from any conductive material such as that employed in forming the outer sleeve member A. The inner sleeve member B may be made in any desired manner and preferably, as is shown in FIGURE 4, is formed from a flat blank of sheet metal which is rolled to the required diameter with the free ends 26 and 27 of the body portion 20 overlapping one another. The rolled ends of the sheet metal blank may be held in place by providing a foldable tab portion 28 at the bottom edge of the blank in longitudinal alignment with the opening 23. When the blank is rolled to the desired diameter, the tab portion 28 will be in alignment with the slot 21 and may be folded outwardly and downwardly through the slot to lock the overlapped portions in place. In the sheet metal blank shown in FIG. 4, the longitudinal slot 21 is adjacent the end 26 with the small opening 23 being immediately adjacent the opposite end of the blank 27 and adjacent the top end of the body portion 20 opposite the end having the connecting lugs 24 secured thereto, with the locking means 22 which is in the form of a struck barb disposed adjacent the top end of the body portion 20 intermediate therebetween. Thus when the ends 26 and 27 of the sheet metal blank are rolled toward one another, end 26 will overlap end 27 with the slot 21 lying on the opposite surface of the body portion 20 and with the opening 23 being in alignment with the upper end of the slot 21. The locking means 22 will be disposed adjacent the upper or top end of the body por-

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tion 20 in diametrically opposed relationship with respect to the slot 21. The connecting lugs 24 are then bent outwardly at substantially right angles to the axial alignment of the body portion 20 to complete the formation of the inner sleeve member.

In the formation and utilization of the tube shield construction 10 just described, reference is now to be had to FIGURES 5 and 6. In the assembly of the inner and outer sleeve members A and B to form the tube shield construction 10, the inner and outer sleeve members A and B are placed in longitudinal alignment, with slot 12 and opening 14 of outer sleeve member A being on the opposite side of slot 21 and opening 23 of the inner sleeve member B. The inner sleeve member B is slightly compressed circumferentially and the outer sleeve member A then slid downwardly thereof to envelope same. This action results in the locking means 13 of the outer sleeve member A and the locking means 22 of the inner sleeve member B riding in the longitudinal slot 21 of the inner sleeve member B and the longitudinal slot 12 of the outer sleeve member B, respectively. By this construction, the inner and outer sleeve members A and B are provided with opposed guideways to permit the relative axial movement one to the other to permit shielding and unshielding of the tube, and to positively prevent the separation of the inner and outer sleeve members A and B. The openings 14 and 23 are in alignment with slots 21 and 12, respectively, and serve to insure in conjunction with locking means 22 and 13, respectively, the positive retention of the outer sleeve member A in a raised position. This is accomplished, as hereinbefore indicated, by having the locking means 13 and 22 flexible and extending inwardly or outwardly, as the case may be, for a distance greater than the thickness of the side walls of the sleeve members A and B. Thus when the outer sleeve member is in a raised position, the locking means 13 and 22 are snapped into the openings 23 and 14, respectively.

In the operation of the tube shield construction 10 just described, the inner sleeve member B is secured to a chassis or support (not shown) by means of bolts, screws or the like passing through the openings 25 of the connecting lugs 24. The electron discharge tube C to be shielded is inserted in its socket (not shown) and the outer sleeve member A is then raised with the locking means 13 and 22 riding in the slots 21 and 12, respectively, until the openings 14 and 23 are reached at which point the locking means 22 and 13 snap into their respective openings to lock the outer sleeve member A in raised position, as shown in FIGURE 5. To replace the electron discharge tube when needed, the outer sleeve member A is pressed downwardly resulting in displacement of the locking means 13 and 22, thereby releasing them from the opening 23 and 14, permitting the sleeve to be pushed downwardly until its bottom edge rests on the connecting lugs 24, as shown in FIGURE 6. The tube is replaced and the outer sleeve member A is raised in the same manner as hereinbefore described to provide in conjunction with the inner sleeve member the desired shielding.

Reference is now to be had to FIGURES 7-13 wherein another form of a tube shield construction made in accordance with the present invention and generally designated by reference numeral 30 is shown, and in which new and improved locking means forming a part of the present invention is shown. The tube shield construction 30 differs from the tube shield construction 10 hereinbefore described in the association of the slots and locking means of the respective sleeve members. In the form shown in FIGURES 7-13, the movable sleeve member is the inner sleeve member and is provided with a slot facing outwardly with the slot of the fixed sleeve member, which in this form is the outer sleeve member, facing inwardly, this arrangement being the reverse of that shown in the tube shield construction hereinbefore described.

The inner tubular sleeve member D as shown in FIGURES 7 and 8 constitutes the movable member of the

tube shield construction 30 and generally will correspond to the same dimensions as the sleeve member A hereinbefore described except that its diameter will be slightly less. The inner tubular sleeve member D comprises a tubular body portion 31 having a longitudinally extending slot 32 formed therein, the slot 32 terminating just short of the top and bottom ends thereof and being accessible thereto only from the outside surface thereof. The body portion 31 is provided adjacent its lower end with an outwardly extending barb, detent, or locking means 33 extending outwardly for a distance greater than the thickness of the wall of the body portion 31, and which is substantially diametrically opposed with respect to the slot 32. A small opening 34 of a width corresponding to that of the slot 32 is present in the body portion 31 immediately adjacent its lower end and in alignment with the slot 32 which in conjunction with the slot 32 and locking means 33 will function with complementary parts of the outer sleeve member E to retain the members in operable relationship and to insure either the raising, locking, or lowering of the inner sleeve member D in a manner to be described more fully hereinafter. An outwardly extending peripheral flange portion 35 is secured to the top free end of the body portion 31 to provide reinforcement there- to and to facilitate the axial movement thereof.

The inner sleeve member D may be made from the same material and in the same manner as the outer sleeve member A of the first form of the invention, as hereinbefore described. Preferably, the inner sleeve member D is formed from a flat blank of sheet metal (see FIGURE 8) which is rolled to the required diameter with the free ends 36 and 37 of the body portion 31 overlapping one another. The rolled ends of the sheet metal blank may be held in this relationship in the same manner as the outer sleeve member A hereinbefore described by means of the foldable tab 38 and the cutout area 39 at opposite ends of the blank cooperating with one another. In the sheet metal blank shown in FIGURE 8, the longitudinal slot 32 is immediately adjacent the end 37 with the small opening 34 being immediately adjacent the lower portion of the opposite end 36, with the locking means 33 which is in the form of a struck barb disposed intermediate therebetween adjacent the bottom edge thereof. Thus when the ends 36 and 37 of the sheet metal blank are rolled toward one another, end 36 overlaps end 37 with the hole 34 and the slot 32 being in alignment with one another, the slot 32 lying on the outside of the body portion 31 with the back being longitudinally covered with the exception of the hole 34. The locking means 33 will lie diametrically opposite the slot 32 adjacent the bottom end of the inner sleeve member D and will extend outwardly therefrom.

The outer tubular sleeve member E as shown in FIGURES 9 and 10 constitutes the fixed member of this form of the tube shield construction 30, and will generally conform to the dimensions of the inner sleeve member B hereinbefore described except that its diameter will be slightly greater in order to permit its envelopment of the inner sleeve member D. The outer tubular sleeve member E comprises a tubular body portion 40 having a longitudinally extending slot 41 formed therein, the slot 41 terminating just short of the top and bottom ends thereof and being accessible thereto only from the inside of the body portion 40. In general, the slot 41 will be of substantially the same dimensions as the slot 32 of the inner tubular sleeve member D. The body portion 40 adjacent its upper end is provided with an inwardly extending barb or locking means 42 extending inwardly for a distance greater than the thickness of the wall of the body portion, and which is diametrically opposed with respect to the slot 41. A small opening 43 of a width corresponding to that of slot 41 is provided in the body portion 40 immediately adjacent its upper end and in alignment with the slot 41. In general, the inner sleeve member A and the outer sleeve member B will possess substantially the same general di-

mensions and configuration, with each having several complementary common parts, although in reverse position. The slot 41, locking means 42, and opening 43 positioned in the upper end of the outer sleeve member E and in operable relationship with and correspond to the slot 32, locking means 33, and the opening 34 positioned in the lower end of the inner sleeve member D to insure the retention of the sleeve members D and E in operable association and to permit either the raising, locking, or lowering of the sleeve member D in a manner to be more fully described hereinafter in the association of the component members to form tube shield construction 30.

In the utilization of the new and improved connecting means forming a part of the present invention for associating the tube shield construction 30 to a support such as, for example, a chassis, reference may be had to FIGURES 9, 10, 11, and 12. As illustrated, the body portion 40 of the tube shield construction 30 is provided at its lower free end with a foldable tab portion 44 which extends downwardly therefrom and in general longitudinal alignment therewith. The foldable tab portion 44 is adapted to extend through a formed slot in a chassis or other support with the lower part thereof being bent outwardly at right angles thereto for engagement with the under surface of the support. A pair of spaced, complementary, circumferentially flexible, snap actuating securing means 45 and 46 are secured to the bottom free end of the body portion 40 and extend downwardly therefrom in longitudinal alignment therewith, and in diametrically opposed relationship to the tab portion 44. The securing means 45 and 46 are adapted to be positioned in spaced slots of a chassis or other support, and by means of a circumferential snap actuation of the complementary securing means and the tab portion 44 will retain the outer sleeve member E in locked engagement with the support.

The illustrative form of each of the securing means 45 and 46 has an angularly inclined outer side edge 47 and 48, each of which is inclined in the direction of one another and terminating in a point. Each of the securing means 45 and 46 has an inner inclined side edge 49 and 50, each of which extends upwardly from the terminal point of the outer side edges 47 and 48 in angular relationship and in the direction of one another. Each of the inner side edges 49 and 50 are provided with inwardly extending, inclined, complementary shoulder portions 51 and 52 immediately adjacent the jointure point with the body portion 40. The shoulder portions 51 and 52 are adapted by a circumferential snap actuation of the securing means 45 and 46 to snap into and engage the immediate area of the support or chassis plate around the slots which are to receive the securing means 45 and 46 and be held in tight engagement therewith. The securing means 45 and 46 are each made from a metal such that any attempt to remove the outer tubular sleeve member E from the support proper will result in a fracturing or breaking of the securing means, thus rendering it incapable of further use. With this construction a technician will be extremely careful to properly actuate the tube shield construction 30, thereby insuring the retention of the outer sleeve member E to the support in fixed relation.

The outer tubular sleeve member E may be made from the same material and in the same manner as the inner sleeve member B of the first form of the invention, as hereinbefore described. Preferably the outer sleeve member E is formed from a flat blank of sheet metal (see FIG. 10), which is rolled to the required diameter with the free ends 53 and 54 of the body portion 40 overlapping one another. The rolled ends of the sheet metal blank may be held in this relationship in the same manner as the inner sleeve member B hereinbefore described by means of the foldable tab 55 and the cut-out area 56 adjacent opposite ends of the blank cooperating with one another.

In the sheet metal blank shown in FIG. 10, the longitudinal slot 41 is immediately adjacent the end 54 with

the small opening 43 being immediately adjacent the upper portion of the opposite end 53, with the locking means 42 which is in the form of a struck barb disposed intermediate therebetween and adjacent the top edge thereof. Thus when the ends 53 and 54 of the sheet metal blank are rolled toward one another, end 53 overlaps end 54 with the hole 43 and the longitudinal slot 41 being in alignment with one another, with the slot 41 lying on the inside of the body portion 40 with the back being longitudinally covered with the exception of the hole 43. The locking means 42 will lie directly opposite the slot 41 adjacent the upper end of the inner sleeve member E and will extend inwardly therefrom.

Securing means 46 extend downwardly from the sheet metal blank immediately adjacent the end 54 with the complementary securing means 45 extending downwardly from the sheet metal blank at the opposite end thereof but spaced inwardly therefrom for a distance somewhat greater than the portion of the sheet metal blank to be in overlapping relationship. The foldable tab portion 44 extends downwardly from the bottom edge of the sheet metal blank at a point substantially midway between the securing means 45 and 46. As is shown in FIG. 10, the inclined outer side edges 47 and 48 extend downwardly from the body portion in angular direction away from one another with the outer side edges 49 and 50 being upwardly inclined in a direction away from one another. Similarly, the formed inwardly extending shoulder portions 51 and 52 as present in the sheet metal blank will face in opposite directions. When the sheet metal blank is rolled to the required diameter, the securing means 45 and 46 will be slightly spaced from one another with the outer edges 47 and 48 extending downwardly in the direction of one another, with the inner side edges 49 and 50 extending upwardly in the direction of one another and the shoulder portions 51 and 52 facing one another in complementary relationship. By this construction, the securing means 45 and 46 will possess the desired circumferential snap actuation whereby the outer sleeve member E will be fixedly secured to the support.

In the formation and utilization of the component parts of the tube shield construction 30 just described, reference is now to be had to FIGURES 11, 12, and 13. In the assembly of the inner and outer tubular sleeve members D and E to form the tube shield construction 30, the inner and outer sleeve members D and E are placed in longitudinal alignment with the slot 32 and the opening 34 of the inner sleeve member D lying diametrically opposite to the slot 41 and opening 43 of the outer sleeve member E. The inner sleeve member D is slightly compressed circumferentially and then slid downwardly into the outer sleeve member E resulting in its envelopment thereof by the outer sleeve member E. This action results in the locking means 42 of the outer sleeve member E and the locking means 33 of the inner sleeve member D riding in the longitudinal slot 32 of the inner sleeve member D and the longitudinal slot 41 of the outer sleeve member E, respectively. By this construction the inner and outer sleeve members D and E are provided with opposed guideways to permit relative axial movement, one to the other, to permit shielding and unshielding of the tube and to positively prevent the separation of the inner and outer sleeve members D and E. The openings 43 and 34 are in alignment with slots 41 and 32, respectively, and serve to insure in conjunction with the locking means 42 and 33, respectively, the positive retention of the inner sleeve member D in a raised position. This is accomplished by having the locking means 33 and 42 displaceable, and extending inwardly or outwardly as the case may be for a distance greater than the thickness of the side walls of the sleeve members D and E. Thus when the inner sleeve member D is in a raised position, the locking means 33 and 42 are snapped into openings 43 and 34, respectively.

In the mounting of the tube shield construction 30 just described and its resulting operation the chassis F is provided with three slotted openings 53, 54, and 55, with the opening 53 lying on one side of the tube socket 56 with openings 54 and 55 lying on the opposite side thereof, and being spaced from one another for a distance slightly less than the spacing of the securing means 45 and 46 such that when inserted therein they will possess the desired snap actuation. As shown in FIGURE 12, the tube shield construction 30 is aligned over the tube socket with the tab portion 44 and the securing means 45 and 46 in alignment with the slotted openings 53, 54, and 55 of the chassis F. The tube shield construction 30 is then tilted to permit the insertion of the tab portion 44 into the opening 53. Upon returning the tube shield 30 to its normal upright position, the flange portion of the tab 44 will engage the under surface of the chassis F and will place the securing means 45 and 46 in registry with the openings 54 and 55. A continued downward exertion of pressure will result in the inclined inward edges 49 and 50 engaging the sides of the openings 54 and 55 closest to one another and will result in the circumferential expansion of the securing means 45 and 46 until the shoulder portions 51 and 52 of the securing means 45 and 46 are reached. At this point the securing means 45 and 46 will snap inwardly to their original position, resulting in that portion of the chassis F immediately adjacent the slotted openings 54 and 55 being in engagement with the shoulder portions 51 and 52. This construction results in the tube shield construction 30 being held in tight engagement at three points. Any attempt to remove the tube shield construction 30 from the chassis F will result in a fracturing or distortion of the securing means 45 and 46 thereby insuring proper caution by a technician when inserting or replacing a tube.

The electron discharge tube G to be shielded is inserted in the normal manner into its socket 56, as shown in FIG. 13. The inner sleeve member E is then raised (see FIG. 11) with the locking means 33 and 42 riding in the slots 41 and 32, respectively, until the openings 43 and 34 are reached at which point the locking means 33 and 42 snap into the respective openings to lock the inner sleeve member D in raised position, as shown in FIG. 11. To replace the electron discharge tube, the inner sleeve member D is pressed downwardly resulting in displacement of the locking means 33 and 42, thereby releasing them from the openings 43 and 34, permitting the sleeve to be pushed downwardly until the flanged portion 35 rests on the top edge of the outer sleeve member E, as shown in FIG. 13. The tube is then replaced and the inner sleeve member D is raised in the same manner as hereinbefore described to provide in conjunction with the outer sleeve member E the desired shield.

Reference is now to be had to FIG. 14 where the new and novel securing means of the present invention for securing a tube shield construction to a support is shown in the form of a plain sheet metal blank. The new and novel securing means of the present invention may be utilized with any type of tube shield construction desired to be permanently affixed to a support regardless of the construction or mode of operation of the tube shield construction. For example, the new and novel securing means may be employed with the tube shield constructions disclosed and claimed in my copending applications Serial Numbers 597,719 and 597,727, filed concurrently herewith, now Patent Nos. 2,908,742 and 2,902,533, respectively.

As illustrated in FIG. 14, a sheet metal blank H is provided with a securing means 57 adjacent the end 58, with the complementary securing means 59 extending downwardly from the sheet metal blank H at the opposite end 60 thereof but spaced inwardly therefrom for a distance somewhat greater than the portion of the sheet metal blank to be in overlapping relationship. A foldable tab portion 61 extends downwardly from the bottom

edge of the sheet metal blank H at a point substantially midway between the securing means 57 and 59. The inclined side edges 62 and 63 extend downwardly from the body portion in an angular direction away from one another and terminating in a point. The opposite side edges 64 and 65 are upwardly inclined from the terminal point of the side edges 62 and 63 in a direction away from one another. Each of the angularly disposed side edges 64 and 65 is provided with an inwardly extending, upwardly inclined shoulder portions 66 and 67, respectively, at a point immediately adjacent the bottom free end of the sheet metal blank H. When the sheet metal blank H is rolled to the required diameter, the securing means 57 and 59 will be slightly spaced from one another, with the edges 62 and 63 extending downwardly in the direction of one another, with the opposite side edges 64 and 65 extending upwardly in the direction of one another, and the shoulder portions 66 and 67 facing one another in complementary relationship. By this construction the securing means 57 and 59 will possess the desired circumferential snap actuation whereby the tube shield construction will be fixedly secured to a support.

It is to be clearly understood that this description just given for the securing means is illustrative in character only since it is readily apparent that the securing means need not be employed with a sheet metal blank, but is equally adaptable to any tubular sleeve member regardless of how made.

Reference is now to be had to FIGS. 15-18 wherein still another form of a tube shield construction made in accordance with the present invention and generally designated by reference numeral 70 is shown. The tube shield construction 70 as shown comprises an outer sleeve member I and an inner tubular sleeve member J, each of which is provided with complementary guide means to permit relative axial or longitudinal movement as well as partial rotational movement with respect to one another.

The outer tubular sleeve member I as illustrated in FIGS. 1 and 2 constitutes the movable member of the tube shield construction 70 and is of a diameter sufficient to permit the placement of an electron discharge tube therein, and of a height less than that of such tube. In general, the height will be such as to permit the easy grasp of a tube placed therein in a manner to be more fully described hereinafter. The outer sleeve member I comprises a tubular body portion 71 having, as illustrated, three, circumferentially spaced, outwardly extending and axially aligned channel members 72, 73, and 74 formed therein. It is to be clearly understood that the number of channel means illustrated is not by way of limitation since the tube shield construction will function satisfactorily when one or two, or more, channel means are present in the body portion 71.

Each of the channel means 72, 73, and 74 comprises a main channel portion 75 extending downwardly from the top free end of the body portion 71 in longitudinal alignment therewith to a point short of the bottom free end thereof. An outwardly extending channel foot portion 76 is secured at substantially right angles to the bottom end of the main channel portion 75 and forms a right angle continuation thereof. This construction results in what may be termed as a bayonet channel or slot in the body portion 71.

The top free end of the body portion 71 is provided with a circumferentially extending, outwardly flared flange portion 77 which is broken at each of the channel means 72, 73, and 74. The channel means 77 serve to provide strength and rigidity to the tubular sleeve member I and will also facilitate the actuation of the sleeve member when raising or lowering the same.

The outer sleeve member I may be made from any suitable metal that is capable of possessing some degree of flexibility and yet will possess sufficient strength to resist bending or distortion. The outer sleeve member I may be made in any desired manner and preferably is formed from a flat blank of sheet metal (not shown)

which is rolled to the required diameter with the free ends 78 and 79 thereof overlapping one another circumferentially. The rolled ends of the sheet metal blank may be held in position by providing a foldable tab (not shown) at the bottom of one end of the sheet metal blank which will engage a cutout portion (not shown) provided on the opposite bottom edge of the blank, and be foldable upwardly with respect thereto. In this manner the free ends 78 and 79 will be held in locked, overlapping relationship, thereby maintaining the desired diameter.

The inner tubular sleeve member J as shown in FIG. 16 constitutes the fixed member of the tube shield construction 70 and is of a diameter sufficient to permit the placement of an electron discharge tube therein and of a height less than that of such tube. In general, the height of the inner sleeve member J will be such that the combined height of both the inner and outer sleeve members I and J when in association with one another will be greater than the height of the electron discharge tube when fixed on a support. Similarly, the diameter of the inner sleeve member J should be just slightly less than the outer sleeve member I so as to permit the inner sleeve member I to be in operable engagement therewith and yet be freely movable with respect thereto without creating unnecessary distortional strain.

The inner sleeve member J comprises a tubular body portion 80 having three spaced guide means 81, 82, and 83 immediately adjacent its top free end thereof. The guide means 81, 82, and 83 are so positioned on the body portion 80 as to be in circumferential registry with the channel means 72, 73, and 74, and will, in association with the channel means of the outer sleeve member I, function to permit the raising, locking, and lowering of the outer sleeve member I in a manner to be more fully described hereinafter. The guide means are shown in the form of pressed dimples, but it is to be understood that this is for the purpose of illustration only since there are other forms of guide means, such as, for example, struck barbs, flanges, and the like, which will function equally as well in association with the channel means of the outer sleeve member I. The lower end of the inner sleeve member J is provided with opposed connecting lugs 84 having an opening 85 therein and extending outwardly from either side of the body portion 80 to permit the securing of the inner sleeve member J to a support, chassis, or the like, by means of screws, bolts, eyelets, or the like. Alternatively, the securing means shown in FIG. 14 may be used equally as well in this form of the invention.

The inner sleeve member J may be made from any suitable metal that is capable of possessing some degree of flexibility and yet will possess sufficient strength to resist bending or distortion. The inner sleeve member J may be made in any desired manner and preferably is formed from a flat blank of sheet metal (not shown) which is rolled to the required diameter with the free ends 86 and 87 thereof overlapping one another circumferentially. The rolled ends of the sheet metal blank may be held in position by providing a foldable tab 88 at the top of the sheet metal blank adjacent the end 86 which will engage a cutout portion 89 provided on the top edge of the blank adjacent the end 87 and be foldable inwardly and downwardly with respect thereto. In this manner the free ends 86 and 87 will be held in locked, overlapping relationship thereby maintaining the desired diameter.

In the formation and utilization of the component parts of the tube shield construction 70 just described, reference is now to be had to FIGS. 17 and 18. In the assembly of the outer and inner tubular sleeve members I and J to form the tube shield construction 70, the outer and inner sleeve members I and J are placed in longitudinal alignment with the guide means 81, 82, and 83, being in alignment with the channel means 72, 73, and 74. The outer sleeve member I is slightly expanded

circumferentially and slipped over the inner sleeve member J until the guide means 81, 82, and 83 seat in the channel members 72, 73, and 74, respectively. At this point the outer sleeve member I will contract to its normal diameter resulting in the guide means 81, 82, and 83 being in sliding frictional engagement with the guide means 72, 73, and 74. By this construction the outer and inner sleeve members I and J are provided with spaced, longitudinal guideways to permit relative axial movement one to the other to permit shielding and unshielding of the tube. Similarly, by providing the foot portion 76 on each of the channel means 72, 73, and 74, the outer sleeve member I may be rotated slightly causing the guide means 81, 82, and 83 to enter into the foot portion 76 of each of the channel means to positively insure the locking of the outer sleeve member I in a raised position, and will also prevent the separation of the outer and inner sleeve members I and J from one another.

In the mounting of the tube shield construction 70 just described, the inner sleeve member J is secured to a chassis or support (not shown) by means of bolts, screws, studs or the like passing through the openings 85 of the connecting lugs 84. The electron discharge tube K to be shielded is inserted in its socket (not shown) and the outer sleeve member I is then raised upwardly with the guide means 81, 82, and 83 riding in the channel means 72, 73, and 74, respectively, until the outer sleeve member I is at its desired height. The outer sleeve member I is then rotated slightly resulting in the guide means 81, 82, and 83 engaging the foot portion 76 of each of the channel means 72, 73, and 74, thereby locking the outer sleeve member I in a raised position, as shown in FIG. 17. To replace the electron discharge tube when needed, the outer sleeve member I is rotated until the guide means 81, 82, and 83 are freed from the foot portion 76 of each of the channel means 72, 73, and 74. The outer sleeve member I is then pressed downwardly until the flange portion 77 of the outer sleeve member I engages the top free edge of the inner sleeve member J, as shown in FIG. 18. The tube is replaced and the outer sleeve member I is raised in the same manner as hereinbefore described to provide in conjunction with the inner sleeve member J the desired shielding.

It should be noted that in the illustrative form of the invention hereinbefore described and illustrated in FIGS. 15-18, the inner sleeve member has been shown in fixed position with the outer sleeve member being actually movable relative thereto. However, it should be clearly understood that this is in no way to be construed as a limitation since the reverse of this construction can be employed equally as well. In this reversed form, the outer sleeve member will be in fixed relation and the inner sleeve member movable relative thereto.

Similarly, while parts have been described as formed of metal herein, it is to be understood that this term includes any conductive material capable of affording the electromagnetic and/or electrostatic shielding desired. For example, metalized or metal coated plastic, or other flexible material, such as metallized celluloid, phenol formaldehyde resin, fibreboard, or the like, may be employed. Likewise, while the barbs 13, 22, 33, and 42 in the form shown as formed by horizontally slitting the metal and pressing outwardly the area immediately below the slit, any other arrangement, such as embossing only or striking out of a tongue, for example, may be employed to provide an abutment face to prevent accidental disassembly of the relatively movable portions of the socket, with a camming face or the like permitting the movable part to be moved to its retracted position as described.

While there have been described herein what are at present considered preferred embodiments of the invention, it will be obvious to those skilled in the art that modifications and changes may be made therein without departing from the spirit and the essence of the invention.

It is therefore to be understood that the exemplary embodiments are illustrative and not restrictive of the invention, the scope of which is defined in the appended claims, and that all modifications that come within the meaning and range of equivalency of the claims are intended to be included therein.

I claim:

1. A telescopic tube shield construction for shielding an electron discharge tube associated with a support comprising inner and outer sleeve means, one said sleeve means having securing means positioned at one end thereof for securing same to a support, the other of said sleeve means being axially movable relative to said fixed sleeve means, said inner sleeve means provided with an axially extending elongated rectangular slotted opening and guide means positioned on opposite sides thereof in diametrically opposed relationship, said outer sleeve means being provided with an axially extending elongated rectangular slotted opening and guide means positioned on opposite sides thereof in diametrically opposed relationship, the guide means of said inner and outer sleeve means riding in the respective elongated rectangular slotted openings of said inner and outer sleeve means to control the axial movement of said movable sleeve means with respect to the fixed sleeve means, and means to lock said movable sleeve means in a raised position.

2. A tube shield construction in accordance with claim 1 wherein the inner sleeve means are provided with securing means and the outer sleeve means is axially movable relative thereto.

3. A tube shield construction in accordance with claim 1 wherein the outer sleeve means are provided with securing means and the inner sleeve means is axially movable relative thereto.

4. A tube shield construction in accordance with claim 1 in which the locking means comprises a small opening in each sleeve means in complementary alignment with each elongated rectangular slotted opening, and a flexible locking member carried by each sleeve means in complementary alignment with each elongated rectangular slotted opening whereby said inner and outer sleeve means when in extended position each flexible locking member will snap into the corresponding small opening to retain said inner and outer members in releasably locked position to shield a tube positioned therein.

5. A telescopic tube shield construction for shielding an electron discharge tube associated with a support in accordance with claim 1 wherein the sleeve means having the securing means positioned at one end thereof for securing same to a support is longitudinally split forming overlapping longitudinally extending, circumferentially flexible edge portions, and the securing means include a pair of spaced, complementary, circumferentially flexible, snap actuating body portions adapted to seat in spaced slots in a support, one of said body portions being secured to each of the overlapping edge portions, and foldable tab means secured to the bottom edge of the tube shield body at a point opposite the pair of body portions and adapted to seat in a slot in a support.

6. A tube shield construction for shielding an electron discharge tube associated with a support in accordance with claim 1 in which the sleeve means having securing means positioned at one end thereof for securing same to a support is longitudinally split forming overlapping, longitudinally extending, circumferentially flexible edge portions and securing means positioned at the bottom edge of each of said longitudinally extending edge portions and extending downwardly therefrom, said securing means being in spaced, complementary, circumferentially flexible snap actuating relationship to one another and adapted by circumferential expansion of said overlapping edge portions to seat in spaced slots in a support.

7. A tube shield construction in accordance with claim 6 in which foldable tab means are secured to the bottom

edge of the tube shield body at a point opposite the longitudinally extending edge portions and adapted to seat in a slot in a support.

8. A tube shield construction in accordance with claim 7 in which the securing means are each provided with a side edge extending upwardly in inclined relationship in the direction of one another and each having complementary, inwardly inclined opposed shoulder portions.

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