Aug. 26, 1947. W. H. HAUPT 2,426,502

BUCKY RETRACTOR

Filed Nov. 23, 1944 2 Sheets-Sheet 1

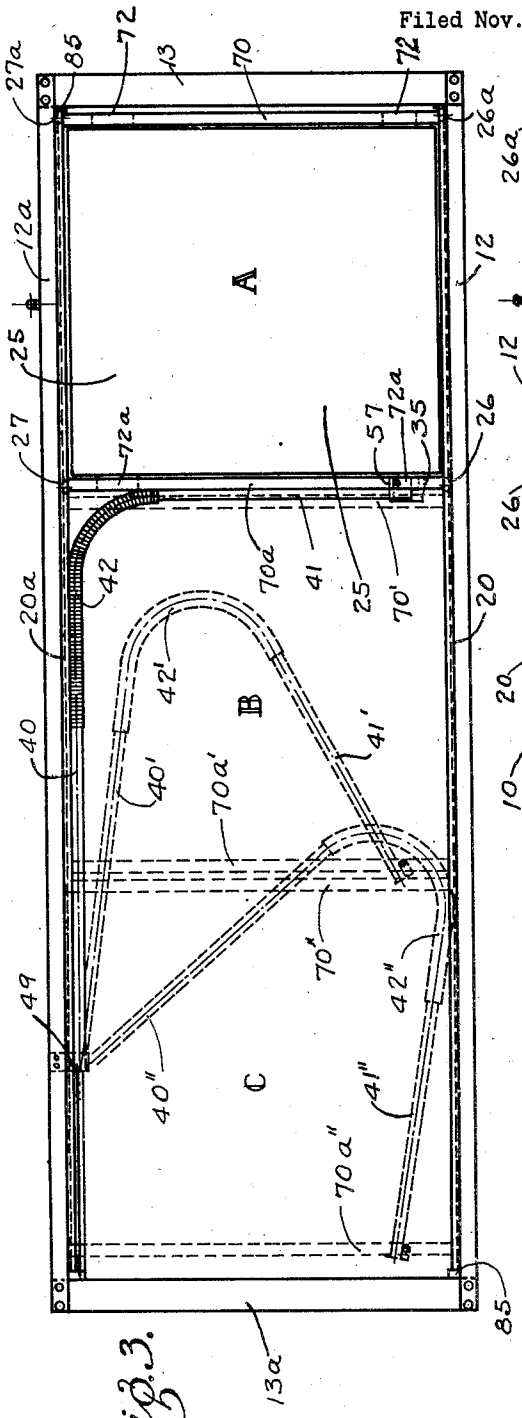


Fig. 3.

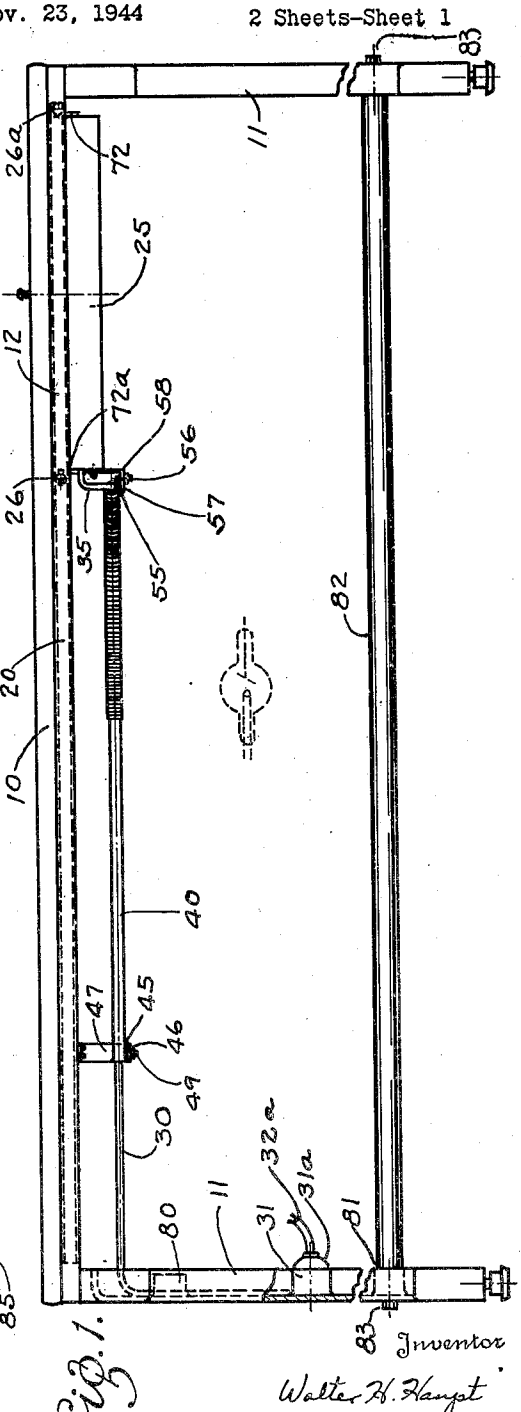


Fig. 1.

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BUCKY RETRACTOR

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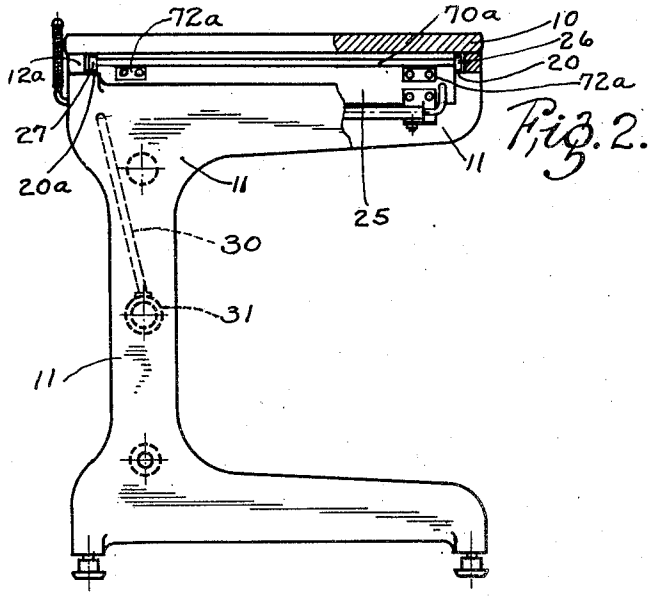


Fig. 2.

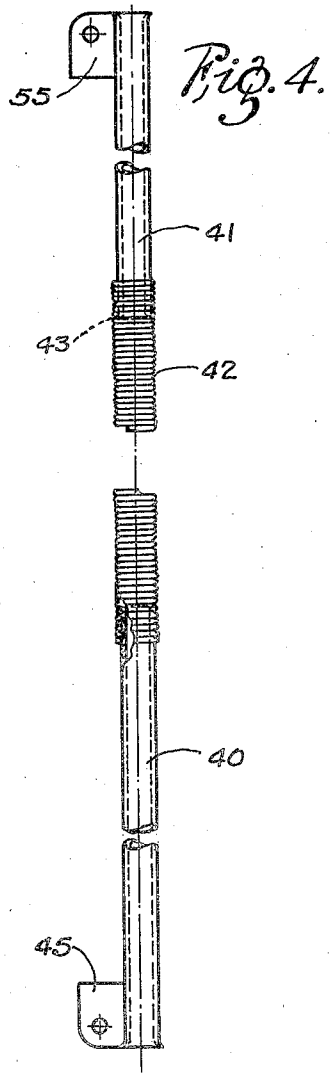


Fig. 4.

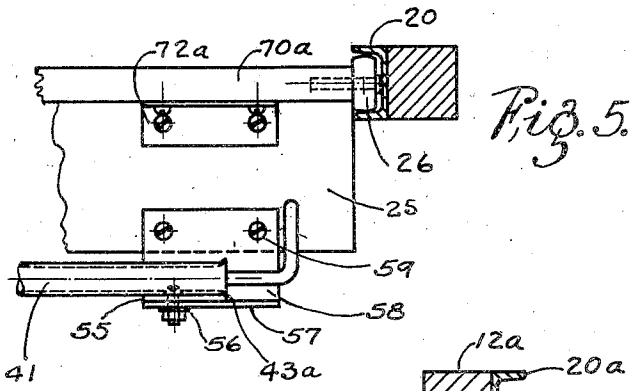


Fig. 5.

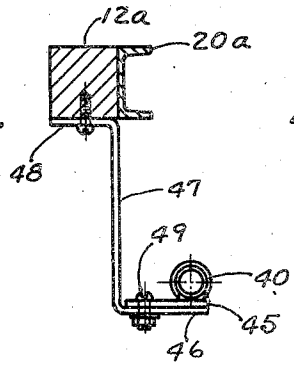


Fig. 6.

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Patented Aug. 26, 1947 2,426,502

UNITED STATES PATENT OFFICE

2,426,502

BUCKY RETRACTOR

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Application November 23, 1944, Serial No. 564,817

20 Claims. (Cl. 250—63)

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This invention relates to X-ray and other apparatus having an electrically connected member movable along a supporting table or the like, and more particularly to X-ray apparatus including a tubular flexible member pivotally connected to a bucky and to the X-ray table and for receiving the electric wires connected to the bucky to permit ready relative movement of the bucky along the table while effectively retaining the wires free from objectionable wear or sagging or movement into objectionable position under or outside of the table.

The present invention is illustrated in connection with X-ray apparatus, with which it is particularly useful. As is well known radiographic X-ray apparatus usually includes a movable "bucky," which may be moved back and forth beneath the table top, on tracks, this bucky serving the purpose of substantially preventing secondary or stray radiation from objectionably affecting the film while permitting free exposure of the film to the direct or primary rays thus giving clear cut pictures. In such apparatus the bucky is usually mounted to travel along tracks positioned closely adjacent the table top on which the patient rests or stands, and it is usually counterbalanced so that it may be readily moved to the general position desired, and held in such position during use.

Such X-ray apparatus is also used for fluoroscopic work. And in such case an X-ray tube, with its necessary high tension wiring, is positioned below the table top. Sometimes a single tube is provided which may be moved to proper position above the table for radiographic work and to the other side of the table for fluoroscopic work. Tubes for radiographic work, which are fixed above the table top, and not intended to be swung below the table top for fluoroscopic work, may be and usually are adequately insulated against any stray high tension currents, and the same is true of the wires connected to them. And by properly grounding such circuits, which is always the case unless inadequate installation work has been done, the danger to the operator or to other parts of the equipment is adequately prevented. In other instances two tubes are used, one located above the table for radiographic work and the other below the table for fluoroscopic work.

Whether the X-ray apparatus is originally provided with one or two tubes, a tube will be positioned below the table for fluoroscopic work, and at such times there will be high tension wires and resultant fields under the table. Every effort

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consistent with proper use of the X-ray apparatus is usually made to safeguard the apparatus by providing adequate insulation for these high tension wires. However also it is very desirable to use lighter wires or cables where this may be done because of lower cost and also greater ease of movement of parts.

For example, the movable bucky has ordinarily been electrically connected to the source of power through flexible wires which are connected to the bucky and are also connected to the source of power through a stationary plug receiving socket carried by a stationary part of the table. The use of such light wires permits ready movement of the bucky back and forth along the table to the various desired positionings for radiographic work. Likewise it permits ready movement of the bucky along the table tracks to a position out of the range of the rays being used for fluoroscopic observation. And because of these wires being ordinarily located entirely below the table top and within the confines of the table and in position where the operator could not ordinarily come in contact with them, the use of these lighter, and less insulated wires, has been common practice in connection with buckies. But since high tension wires and fields exist under the table during such fluoroscopic work it has been necessary to provide means to permit movement of the bucky and still maintain control of its wires or cables to prevent them from coming into contact with any high tension wires and from moving into an objectionable high tension field.

The constructions heretofore used for this purpose have all been subject to substantial objection. One of the usual expedients has been to provide reels with spring retractors, the springs of the reels serving to keep the individual strands of wire connected to the bucky under tension and prevent them from sagging into contact with the high tension wires or moving into a high tension field. This has been subject to objection, for example the reels with spring retractors keep the individual strands of wire under tension and thereby produce a pull on the bucky which is an undesirable feature, and this also presents a hazard that wires may break under the tension and thus fall into direct contact with the high tension wires which are usually directly below the bucky wires referred to. And obviously if this should occur the operator might touch some part of the table subjected to the high tension current, with disastrous results. Although every effort is made by compenent and conscientious installers of X-ray equipment to make sure that

the line circuits will be properly grounded, nevertheless through poor workmanship or carelessness the grounding may not be properly made. Furthermore the ground may become corroded, or in old buildings a seemingly complete ground may be inadequate because of improper insulation to the electric wiring, or of water pipes or such other means as is used for the grounding. And if there is improper grounding and the bucky wires should for any reason contact with the high tension wires, considerable damage might be occasioned at places more or less remote from the X-ray apparatus itself. While regular ground wires are usually provided and it is the duty of the man installing the X-ray apparatus, or of the service man inspecting it, to make sure of proper grounding nevertheless cases do arise where serious damage to the apparatus or to the operator have occurred.

Another method has been to utilize a trough in which the bucky wires were laid, being pulled out of the trough by motion of the bucky and moved back and retained in the trough by spring means. This arrangement eliminates slack trailing wires, but again presents the objectionable spring pull on the bucky and also continuous movement of the electric insulated wires on movable rollers which tends to cause deterioration or wear of the wire insulation and undesirable electric contact with some part of the apparatus.

Another arrangement also heretofore used has involved a set of sliding contacts which required semi-exposed bus bars to be laid in and insulated in the frame of the table. These depended on sliding contacts to make and keep electrical contact at all times and had objectionable features and drawbacks of wear, possibility of broken wires, etc.

One of the principal objects of the invention is to provide means in connection with a movable bucky which permits of ready and easy operation of the bucky and of preventing the cable or any of the wires associated with the bucky from contact with high tension wires or objectionably moving into a high tension field.

Another object is to provide means for handling of the bucky wires so as to prevent the objectionable features of sagging wires, short-circuiting due to worn out insulation, exposed sliding contacts, and the like; while at the same time avoiding objectionable pull on the bucky.

Another object is to provide apparatus for enclosing the wires connecting the movable bucky with the stationary outlet which is effective and dependable in its operation and permits more ready and satisfactory operation of the bucky without the hazards and dangers referred to.

Still another object is to provide a flexible tubular connector which is inexpensive and simply constructed and readily installed in pivotal connection at its opposite ends with a movable member and a table, or the like, along which such member is movable to different operating positions, and which is effective to receive and retain electric wires or cables and permit ready relative movement of the member and supporting table while preventing objectionable wear or strain upon the wires and at the same time holding them within a predetermined limited zone with respect to the movable member, throughout its range of movement.

Another object is to provide a flexible tubular container for the bucky wires which is so constructed and positioned that during operation the connector and wires will at all times be positioned

to be outside of the space not covered by the bucky (the bucky being moved away from the field of observation in fluoroscopic work) to thus avoid interference with the operator's view in fluoroscopic work.

Other objects and advantages will be apparent from the description and claims and the drawing.

In the drawing, in which a preferred embodiment of the invention is disclosed—

Fig. 1 is a somewhat diagrammatic side view, with parts broken away, of an X-ray table embodying a preferred embodiment of the invention;

Fig. 2 is an end view of Fig. 1, with parts broken away at the top and shown in section to more clearly illustrate the construction;

Fig. 3 is a plan view of Fig. 1 with the table top removed showing the bucky and the flexible connector in full lines at its extreme right-hand position; and in dotted lines showing the positioning of these parts at the other extreme of bucky travel and also at an intermediate position along the table;

Fig. 4 is a view of the flexible connector with the pivoted members affixed to the ends of the two substantially rigid tubular sections;

Fig. 5 is a detail view of the pivotal connection between the bucky and the shorter tubular member showing also the mounting of the bucky axle and a roller and a track caused by the side rail; and

Fig. 6 is a fragmentary detail view of the interconnection between the table and the longer tubular member of the connector.

The accompanying drawing illustrates, somewhat in diagrammatic form, a preferred embodiment of the invention, which has been found satisfactorily operable in use, as applied to an X-ray apparatus the top of which is shown in horizontal position. The positions of the radiographic and fluoroscopic tubes are not shown in detail, but a positioning of the fluoroscopic tube is diagrammatically illustrated in dotted lines in Fig. 1. The top of this table is indicated by the numeral **10**, in Fig. 1, and is shown diagrammatically, as of a usual construction and supported upon suitable end supports **11**, which likewise may be of suitable and usual construction, and are of the U-shaped form shown. Two spacer bars **12** and **12***a* are provided, the opposite ends of one of these bars being connected to the top surface of one side of each of the end supports, and the other being connected at each of its opposite ends to one of the end supports. These bars **12**, **12***a* serve the dual purpose of helping to connect the end supports in proper position, and also to receive the top **10**, which is fastened to them, as by means of suitable screws or bolts.

Below the table top, and carried by each of the side bars **12**, **12***a* respectively is a track, the pair of tracks being designated as **20**—**20***a*. Each of these tracks serves suitably to support the bucky, by means of rollers, the tracks being illustrated herein as U-shaped or channel shaped in cross-section, with the legs of each U so positioned that the bucky roller will readily travel back and forth as it is desired to cause movement of the bucky, and each track being positioned directly beneath the table top, and extending longitudinally throughout the length of the top.

The bucky is indicated by the numeral **25**, and as will be clear from Figs. 1, 2 and 3 the bucky has two rollers on each side, those on one side being marked **26** and **26***a* respectively and those on the other side **27** and **27***a* respectively, these

rollers being supported from the bucky upon suitable axles with outstanding shafts and are of such size that they will roll smoothly along tracks **20** and **20***a*, with the part of the overhanging track serving to insure smooth operation of the bucky. The bucky as shown is of usual character, being rectangular and somewhat wider than long and is counterbalanced in any suitable way, not shown, to permit of easy ready movement of it along the tracks to any desired position beneath the table and to remain in any selected position. It has the usual approved construction and mechanism for causing it to function satisfactorily in the making of radiographic pictures, which is well known and therefore not illustrated. In the form of construction as illustrated the dimensions of the bucky are approximately 21¾ inches in the direction of the length of the table and 23 inches across; but these dimensions are illustrative and the bucky will of course have proper dimensions to fit the table with which it is to be used. In the table using the bucky of the dimensions referred to and illustrated in the drawing the over-all length of tracks **20**—**20***a* is 72½ inches, and the distance between the side bars **12**—**12***a* is 24¼ inches, with the over-all outside width of the table 26¼ inches.

As shown in Fig. 3 the top of the table is removed and the position of the bucky between the tracks is clearly illustrated, the position of the bucky directly below the tracks and below the top of the table being clearly shown in Figs. 1 and 2.

In these figures the actual positioning of the bucky, as illustrated, corresponds, and it is shown in full lines; and in Fig. 3 this actual positioning of the bucky is illustrated by the letter A which indicates the zone within which the bucky is located in the positioning illustrated in the drawing. Likewise two other zones marked respectively B and C are illustrative of two other positionings along the table into which the bucky may be moved in operation, although as stated the bucky may be moved to any desired position and is counterbalanced so that it will remain in any position into which it is moved.

In the invention as illustrated the objectionable types of constructions or arrangements whereby the wires are connected to the bucky and to the stationary connector on the table are avoided. In this invention the wires or cable for connecting the bucky to a source of electrical supply bear the numeral **30**, the lower end being connected into a connector or socket member **31**, which is adapted to receive a suitable connecting cable from the electric wiring system, by means of a plug **32** attached to the end of the electric supply cable **32***a*, which plugs into the socket **31** in known manner. Conductor wires, which are illustrated as in the form of a flexible cable, are connected to the supporting end of the table by means of suitable clips or the like which are not thought necessary to illustrate as they may be of any suitable form for attachment to the table structure to support the cable **30** in desired positioning. As illustrated the cable extends upward from the socket **31** and then connects into the bucky in usual manner at the position indicated by the numeral **35**.

During a considerable portion of its extent the cable **30** passes through a flexible tubular member which includes as end portions or elements a longer hollow tube or pipe **40** and a shorter hollow tube or pipe **41**, both of which are of metal or other material sufficiently rigid to readily withstand the weight of the bucky cable. These two tubular pipe sections **40** and **41** are connected by a flexible hollow tubular member **42**, which has one of its ends connected to the section **40** and the other to section **41**. This tubular connection **42**, as illustrated is preferably made of high tension spring wire, such as piano wire, formed into very close windings, thus providing a flexible hollow tube which is substantially self-sustaining and will not sag to any objectionable degree. This flexible connection **42** has its respective ends connected respectively to the corresponding ends of the rigid tubular portions **40** and **41**. As shown each unpivoted end of the tubular portions **40**—**41** is somewhat flared, as shown at **43**, and this flared end, which is like the flared end shown at **43***a* in Fig. 5, serves as a thread so that the corresponding ends of the flexible portion **42**, may be screwed or threaded a sufficient distance onto the ends of the portions **40**—**41**. Because of the enlargement in diameter of the flared end the coiled portion **42** will not pull off and will be held suitably and sufficiently for satisfactory operation. If desired, however, these flexible ends may be affixed to their respective portions by means of soldering, but with the arrangement described this should not be necessary and the construction described permits of ready connection or disconnection of the ends of the flexible portion **42** by screwing it on or off. The ends of the tubular members extend onto the corresponding ends of the flexible portion a sufficient distance to permit of a tight connection, three-eighths to half an inch usually being found sufficient.

The other end of the tube **40** is brazed to a connecting plate **45**, which in turn is pivotally attached to the over-turned end **46** of a supporting bracket member **47**. As shown this bracket member **47** has an over-turned upper portion **48** which is attached by means of screws or the like to the side **12***a*, the lower end **46** extending horizontally below the track members to receive the plate **45** in pivotal connection, the pivot and connecting being shown as by means of a bolt, nut and washer and indicated with a numeral **49**. As shown most clearly in Fig. 4 the plate **45** has a corner rounded so as to permit movement thereof about its pivotal connection **49** without striking the bracket **47**, and to permit swinging of the tubular portion **40** inwardly underneath the table, but the opposite portion of the plate, upon which the end of the tube **40** is brazed, is flat and without such a rounded corner so that any tendency of the tube **40** to swing in the opposite direction is prevented and this flat portion or edge acts as a stop as it comes against the depending portion **47** so that the other end of the tube **40** will not move outside the extent of the table top.

The shorter tube **41** is likewise brazed to a plate **55**, similar to the plate **45**, which is in turn connected by pivot **56** to an over-turned supporting portion **57** carried at the lower end of a bracket member **58**, the upper end of which is attached by means of screws or the like, as indicated at **59** to the side of the bucky. And this plate **55**, likewise, has one corner rounded, as shown most clearly in Fig. 4, so that the rigid tube **41** may readily swing, as the bucky is moved, to extend underneath the bucky, but this too, being pivoted off center, is so arranged that the tube **41** may move readily, as indicated in Fig. 3, as the bucky is moved along the tracks, but its flat side or edge portion will act as a stop, by striking against the bracket **58**, to prevent the tube from swinging so that any portion of its extends beyond or out-

side of the table top and also so that it may not swing in the reverse direction or so that its end connected to the flexible portion 42 cannot move to cause the flexible portion 42 to assume a reverse or S curve in operation.

As shown, the relative lengths of the rigid tubes 40 and 41, and the flexible middle section 42 are such that the bucky may be moved freely along the length of the table, the flexible portion permitting the rigid tubular portions to move into different angular positions with respect to each other, without any kinking or twisting of the flexible portion and without any portion of this cable supporting tubular member extending beyond the edges of the table top. As shown, with the bucky in the one extreme position indicated by the zone A the rigid tube 40 lies substantially alongside and parallel to the track attached to the side 12a while the shorter tubular member 41 lies substantially along and parallel to the bucky. And when moved to other positions, such as exemplified by the positions of zones B and C of Fig. 3 the result is that the longer tube tends to swing inwardly about its pivot connection from the position parallel to the side of the table to occupy a position approaching a perpendicular to the side of the table, two positions being illustrated in dotted lines as 40' and 40'', whereas the shorter rigid tube 41 tends to swing about its pivot and beneath the bucky, toward a position approaching parallelism with the side rail 12 of the table two corresponding positions being shown in dotted lines in zones B and C as 41' and 41'' respectively. As shown the members 40 and 41 are of such dimensions and are so connected that in the zone A they are substantially at right angles to each other but occupy more acute angular positions with respect to each other as the bucky is moved towards the other end of the table, and because of this relative arrangement and the length of the respective parts, the flexible portion 42 lies through a considerable portion of its length parallel with the side of the table when in A position and a lesser portion is turned to its connection with the shorter portion 41, which is then substantially parallel to the bucky and transverse across the table and perpendicular to the longer portion 40. In all other positions the flexible portion is bent so that the angle between its portions is decreased as indicated by dotted lines in Fig. 3 by the numerals 42' and 42''. In this way, all tendency for the portion 42 to bend in other than one direction is avoided and any twisting or S curves are avoided and consequently the electric cables in operation will not be damaged or pinched in any way. However, the tubes 40 and 41 need not necessarily occupy an exact 90° angle when the bucky is in the zone A but the length of those tubes, the length of the flexible portion 42, and the relative positioning of the pivot points for the tubes 40 and 41, should be such that as the bucky moves from the zone A there is no tendency for the end of the tubes 40 and 41 to move so as to provide other than a simple U-bend in the flexible portion 42. A very effective way of accomplishing this is to use the arrangement shown, with the bracket 58 and pivot point 56 positioned inwardly somewhat from the side of the table, and with the parts 40 and 41 substantially at the 90° angle. However, since the plates for the members 40 and 41 can be arranged so as to provide stops and permit pivotal movement in only one direction, the 90° angle may be somewhat deviated from. But in any event the arrangement should be such that the forces acting upon these two rigid tubes and the flexible section, which has a normal tendency to straighten out, will be such that the flexible section itself will resist such twisting or kinking as might damage the electrical wiring within it, and this is readily accomplished by the arrangement as illustrated in which the flexible portion 42 is prevented from taking the shape of an S or compound curve, and the parts are so located in relative arrangement that it will take such simple U-curves.

With the dimensions for the table and for the bucky, as given above, the substantially right angular arrangement of the long and short tubes 40 and 41, as illustrated in Fig. 3 will result when the long tube or section has an over-all length of 22 inches, the shorter tube 41 has an over-all length of 16 inches and the flexible section 42 has an over-all length of 13 inches, with approximately three-eighths of an inch overlap of the flexible section at each end on the respective cooperating ends of the two rigid tubes as stated above. And very satisfactory results have been secured when this flexible section is close wound from piano wire, or the like, which will give adequate flexibility, and with close winding will prevent any objectionable sagging. If the dimensions of the table and of the bucky are changed corresponding changes may readily be made in the length of the several sections 40, 41 and 42, and some change also may be found desirable or required for the precise location of the pivot points of the two rigid tube sections. But in any event it is desirable that the relative dimensions and the points of pivoting should be such that the simple U-bend will be secured in operation, and so that the ends of the rigid tube portions will not cross each other or cause an S or compound curve in the flexible portion. These points can readily be determined, especially as the pivot points should be so arranged that neither of the rigid tubes will move outside the extent of the table top, having in mind also that if the section 42 is a close wound wire having considerable resiliency the relative angular relationship of the members 40 and 41 may be readily ascertained so that the wire section itself will tend to swing the ends of the sections 40 and 41 apart as the bucky is moved, even though the maximum angle between them might not be the substantially 90° angle illustrated.

As will be noted, particularly with reference to Fig. 3, the relative dimensions, the relative positioning and the points of pivotal connection of the composite tubular members 40—41—42 are such that these members are always positioned out of the way of the fluoroscopic tube, whatever the position of the bucky. In Fig. 3, for example, with the bucky in the position A it will be noted that the composite tube leaves substantially two-thirds of the space under the table top completely free from obstruction by wires, or the tube. If the bucky moves to zone B then the zone A is completely free from obstruction and the zone C is substantially free, the longer tube section 41' in that position still being almost parallel to the side of the table and most of this composite tubular member being located beneath the bucky itself. And fluoroscopic work in such circumstances could be done without any interference, with the tube positioned in the zone A or the zone C. And with the bucky in zone C the entire composite tube member is beneath the bucky leaving the zones A and B entirely free from any interference with the fluoroscopic work.

In further explanation it will be noted that the bucky is provided at each end with an axle member, these two axles being designated **70** and **70***a* respectively, the rollers **26**, **26***a*, **27**, **27***a* for supporting the bucky for ready movement being carried upon these axle members, the same axle members being shown, of course, in the positions of the bucky as illustrated in dotted lines in zones B and C by **70'**—**70***a'* and **70''**—**70***a''* respectively, and the axle members being attached to the bucky by any suitable connecting brackets, such as those designated **72**, **72***a* in Fig. 1, there being one of these bracket attaching members at each end of the bucky axle.

Furthermore, as shown in Figs. 1 and 2 each end member is provided with two socket receiving members designated respectively **80** and **81**, which are adapted to receive a cross-bar **82**, each of its ends being attached to one of the end supports by suitable bolt **83**.

It will also be noted that a bumper **85** of rubber or similar acting material is affixed to the table at each end of the tracks **20**—**20***a* to avoid undue shock to the bucky as it comes to the extreme end of its travel in either direction.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. X-ray apparatus of the character described comprising a table, a bucky movable beneath said table, a supporting track for said bucky carried by said table, a hollow flexible connector member, comprising a longer rigid tubular section pivotally connected at one end adjacent one side of the table, a shorter tubular member pivotally connected at one end to the bucky, and a flexible middle section connecting the unpivoted ends of said rigid tubular sections, each of said rigid tubular sections and the flexible middle section being of such relative proportions that at no time during movement of the bucky will any portion of the composite flexible tubular member extend beyond the extent of the table, means for limiting swinging travel of the rigid tubular sections each in one predetermined direction, the length of said composite flexible tubular member and the points of pivotal connection of its rigid sections being such that the flexible middle section will at all times be positioned in the simple curve, and curved in the same direction.

2. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track, flexible means connected at one end to said table and at the other end to said movable member, said flexible means comprising a substantially rigid end section pivotally connected at one end thereof to the table and at its other end to a flexible middle section, and a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said flexible middle section.

3. Apparatus of the character described comprising a table, supporting means, a member movable along said supporting means, flexible means connected at one end to said table and at the other end to said movable member, said flexible means comprising a substantially rigid end section pivotally connected at one end thereof to the table and at its other end to a flexible middle section, and a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said flexible middle section.

4. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track, flexible means connected at one end to said table and at the other end to said movable member, said flexible means comprising a substantially rigid end section pivotally connected at one end thereof to the table and at its other end to a flexible middle section, and a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said flexible middle section, the lengths of said rigid sections being such that no part of the composite tubular member will extend beyond the table top as the movable member is moved to different positions along the said top.

5. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track, flexible means connected at one end to said table and at the other end to said movable member, said flexible means comprising a substantially rigid end section pivotally connected at one end thereof to the table and at its other end to a flexible middle section, a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said flexible middle section, and stop means limiting the pivotal travel of each of said rigid sections so that the ends connected to the flexible section will move in predetermined directions and will follow paths whereby the flexible section will be prevented from kinking or assuming a compound curve.

6. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track, flexible means connected at one end to said table and at the other end to said movable member, said flexible means comprising a substantially rigid end section pivotally connected at one end thereof to the table and at its other end to a flexible middle section, and a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said flexible middle section, the first of said rigid sections being longer than the second, and the maximum angle between them in any position of the movable member being such that the paths of the ends of such rigid members will not cross during any positioning of the movable member and the flexible member will be maintained in a simple U-curve and prevented from kinking or forming a compound curve.

7. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track to a plurality of positions, flexible means connected at one end adjacent one side of said table and at the other end connected to said movable member adjacent the other side of said table, said flexible member comprising a substantially rigid end section pivotally connected at one end thereof with the table and at its other end to a flexible middle section which is substantially non-sagging in all operative positionings, and a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said flexible middle section, means limiting the pivotal travel of each of said rigid sections so that the

ends connected to the flexible middle section will move in predetermined directions, the lengths of said several sections and the location of said points of pivotal connection being such relatively that throughout the entire path of movement of the movable member the ends of said rigid sections will not cross each other and the curvature of said flexible middle section will at all times be a simple curve with the curvature always in the same direction.

8. Apparatus of the character described comprising a table, parallel supporting track members carried by said table along opposite sides thereof, a member supported by and movable along said tracks to a plurality of positions, flexible means connecting said table and said movable member, said flexible means comprising two substantially rigid end sections and a flexible middle section connected at one end to one of said rigid sections and at the other end to the second of said rigid sections, one of said rigid end sections being pivotally connected at its other end to said table adjacent one end of one of said tracks and the other rigid section being pivotally connected at its other end to said movable member adjacent the other track, the one of said rigid sections being longer than the other and the location of said points of pivotal connection being relatively so spaced along the table that at one extreme of travel of the movable member the flexible section will lie along a simple U curve with the end of the second rigid section connected thereto closer to the end of the movable member than the cooperating end of the first rigid section, and at the other extreme of travel of said movable member the end of the first rigid section will be closer to said end of the movable member than said end of the second rigid member, and the distance between said ends and the relative location of their pivotal points being such that in all positions of the movable member the flexible section will form a simple curve, always curved in the same direction.

9. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track to a plurality of positions, flexible means connecting said movable member to said table, said flexible member comprising a substantially rigid end section pivotally connected at one end thereof with the table adjacent one side and at the other movable end to a flexible middle member, a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said middle section, the length of the first said section being greater than the length of the second, and both said sections being longer than the flexible middle section, and the location of said points of pivotal connection being such that with the movable member at one extreme of its travel along the table the entire second rigid section and its pivotal connection will lie substantially closer to said extreme end than the cooperating end of the longer first section, the distance between such ends being such that the flexible middle section will lie along a simple U-curve.

10. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track to a plurality of positions, flexible means connecting said movable member to said table, said flexible member comprising a substantially rigid end section pivotally connected at one end thereof with the table adjacent one side and adjacent one end thereof and at the other movable end to a flexible middle member, a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said middle section, the length of the first said section being greater than the length of the second, and both said sections being longer than the flexible middle section, and the location of said points of pivotal connection being such that with the movable member at the extreme of its travel along the table most remote from the pivotal connection of the larger rigid section the entire second rigid section and its pivotal connection will lie substantially closer to said extreme end than the cooperating end of the longer first section, the distance between such ends being such that the flexible middle section will lie along a simple U-curve, and the relative lengths of the said several rigid and flexible sections, and their respective pivotal points being such that the ends of the rigid sections will not cross each other during movement of the movable member along the table and the flexible middle section will at all times be a simple curve with the curvature in the same direction.

11. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track to a plurality of positions, flexible means connecting said movable member to said table, said flexible member comprising a substantially rigid end section pivotally connected at one end thereof with the table adjacent one side and at the other movable end to a flexible middle member, a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said middle section, the length of the first said section being greater than the length of the second, and both said sections being longer than the flexible middle section, and the location of said points of pivotal connection being such that with the movable member at one extreme of its travel along the table the entire second rigid section and its pivotal connection will lie substantially closer to said extreme end than the cooperating end of the longer first section, the distance between such ends being such that the flexible middle section will lie along a simple U-curve, and the rigid sections being arranged substantially at 90° to each other.

12. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track to a plurality of positions, flexible means connecting said movable member to said table, said flexible member comprising a substantially rigid end section pivotally connected at one end thereof with the table adjacent one side and at the other movable end to a flexible middle member, a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said middle section, the length of the first said section being greater than the length of the second, and both said sections being longer than the flexible middle section, and the location of said points of pivotal connection being such that with the movable member at one extreme of its travel along the table the entire second rigid section and its pivotal connection will lie substantially closer to said extreme end than the cooperating end of the longer first section, the distance between such ends being such that the flexible middle section will lie along a simple U-curve, the longer rigid

section being pivotally connected to lie substantially parallel with its adjacent track in one extreme position of the movable member and substantially transverse to the tracks in the other extreme position.

13. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track to a plurality of positions, flexible means connecting said movable member to said table, said flexible member comprising a substantially rigid end section pivotally connected at one end thereof with the table adjacent one side and at the other movable end to a flexible middle member, a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said middle section, the length of the first said section being greater than the length of the second, and both said sections being longer than the flexible middle section, and the location of said points of pivotal connection being such that with the movable member at one extreme of its travel along the table the entire second rigid section and its pivotal connection will lie substantially closer to said extreme end than the cooperating end of the longer first section, the distance between such ends being such that the flexible middle section will lie along a simple U-curve, said shorter rigid section being pivotally connected to lie substantially parallel to the tracks in one extreme position of the movable member and approaching a substantial parallelism with the track adjacent its pivotal connection at the other extreme position of said movable member.

14. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track to a plurality of positions, flexible means connecting said movable member to said table, said flexible member comprising a substantially rigid end section pivotally connected at one end thereof with the table adjacent one side and at the other movable end to a flexible middle member, a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said middle section, the length of the first said section being greater than the length of the second, and both said sections being longer than the flexible middle section, and the location of said points of pivotal connection being such that with the movable member at one extreme of its travel along the table the entire second rigid section and its pivotal connection will lie substantially closer to said extreme end than the cooperating end of the longer first section, the distance between such ends being such that the flexible middle section will lie along a simple U-curve, the longer rigid section being pivotally connected to lie substantially parallel with its adjacent track in one extreme position of the movable member and substantially transverse to the tracks in the other extreme position, and a length of said longer rigid section being less than the transverse width of the table.

15. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track to a plurality of positions, flexible means connecting said movable member to said table, said flexible member comprising a substantially rigid end section pivotally connected at one end thereof with the table adjacent one side and at the other movable end to a flexible middle member, a second substantially rigid end section pivotally connected at one of its ends to said movable member and at its other end to the other end of said middle section, the length of the first said section being greater than the length of the second, and both said sections being longer than the flexible middle section, and the location of said points of pivotal connection being such that with the movable member at one extreme of its travel along the table the entire second rigid section and its pivotal connection will lie substantially closer to said extreme end than the cooperating end of the longer first section, the distance between such ends being such that the flexible middle section will lie along a simple U-curve, the longer rigid section being pivotally connected to lie substantially parallel with its adjacent track in one extreme position of the movable member and substantially transverse to the tracks in the other extreme position, and a length of the longer rigid portion being less than the transverse width of the table and the relative lengths of the two rigid sections and the flexible section and their relative pivotal points being so coordinated that no portion of the composite flexible member will extend beyond said table at any positioning of the movable member.

16. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along the said track, flexible means connected at one end to said table and at the other end to said movable member, said flexible means comprising two substantially rigid end sections connected by a flexible middle section, and stop means controlling the swinging path of each rigid section to prevent any portion of said flexible means from extending beyond the table.

17. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track, flexible means connected at one end to said table and at the other end to said movable member, said flexible means comprising two substantially rigid end sections, said rigid sections being of different lengths, the longer of said sections being pivotally connected adjacent the side of the table and the shorter of said sections pivotally connected to the movable member, and stop means cooperating with the pivoted end of said longer section to limit swinging travel thereof to the zone lying within the confines of said table.

18. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track, flexible means connected at one end to said table and at the other end to said movable member, said flexible means comprising two substantially rigid end sections, said rigid sections being of different lengths, the longer of said sections being pivotally connected adjacent the side of the table and the shorter of said sections pivotally connected to the movable member, and stop means cooperating with the pivoted end of said shorter section to limit swinging travel thereof to the zone lying within the confines of said table.

19. Apparatus of the character described comprising a table, a supporting track carried thereby, a member movable along said track, flexible means connected at one end to said table and at the other end to said movable member, said flexible means comprising two substantially rigid end sections, said rigid sections being of different lengths, the longer of said sections being pivotally connected adjacent the side of the table and the shorter of said sections pivotally connected to the

movable member, and stop means associated with each of said rigid members to permit swinging travel of each member in one direction but prevent the travel in the opposite direction and to confine the swinging travel of both sections and to confine the positioning of the flexible member so that all portions thereof will lie within the confines of the table top in all positions of the movable member.

20. X-ray apparatus of the character described comprising a table, a bucky movable beneath said table, a supporting track for said bucky carried by said table, a hollow flexible connector member, comprising a longer rigid tubular section pivotally connected at one end adjacent one side of the table, a shorter tubular member pivotally connected at one end to the bucky, and a flexible middle section connecting the unpivoted ends of said rigid tubular sections, each of said rigid tubular sections and the flexible middle section being of such relative proportions that at no time during movement of the bucky will any portion of the composite flexible tubular member extend beyond the extent of the table, means for preventing swinging travel of the rigid tubular sections in one direction, the length of said composite flexible tubular member and the points of pivotal connection of its rigid sections being such that the flexible middle section will at all times be positioned in the simple curve, and curved in the same direction, and electrical conductors connected at one end to the bucky and at the other end at a fixed position on said table, said electrical conductors passing through and being supported by said composite flexible member during movement of the bucky, whereby said electrical conductors are freed from strain or substantial sagging during movement of the bucky along the table.

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