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X-RAY EQUIPMENT FOR INSPECTION

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Fig. 1.

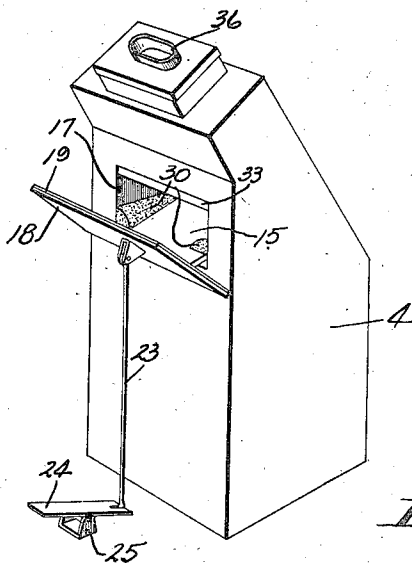


Fig. 2.

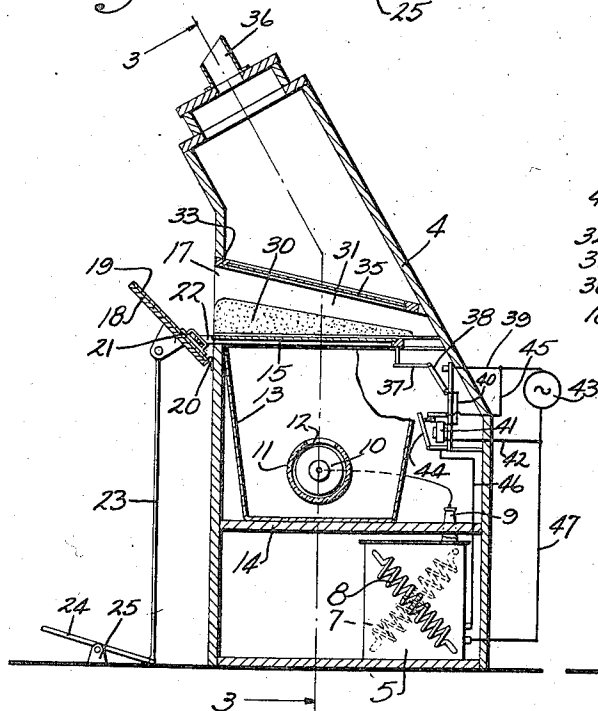
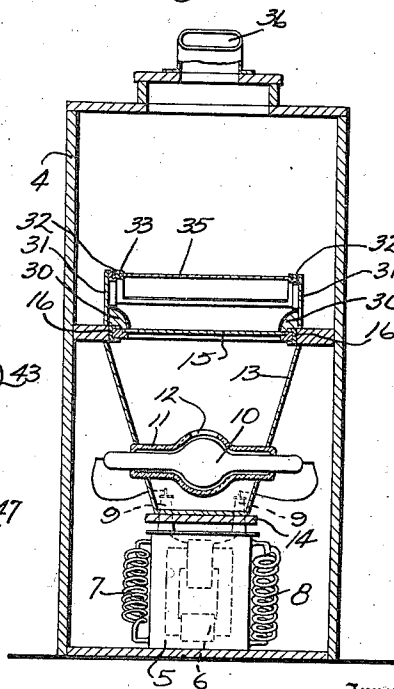


Fig. 3.



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X-RAY EQUIPMENT FOR INSPECTION

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8 Claims. (Cl. 250—34)

This invention relates to improvements in X-ray equipment for inspection.

The device is particularly designed for the inspection of shoes by X-ray to ascertain whether sewed shoes are free of the nails used in assembling their parts, but the same apparatus herein disclosed to exemplify the invention may be used without change or with minor changes within the spirit of the invention to inspect a variety of other articles.

It is the object of the invention to provide a simple compact and efficient apparatus of novel form for inspection purposes, due regard being had for the protection of the operator and for facilitating the insertion, positioning and withdrawal of the objects to be inspected.

It is a further object of the invention to provide a device in which the several component operating parts are conveniently and compactly disposed with reference to each other in the enclosing cabinet.

In the drawing:

Figure 1 is a perspective view of a complete device embodying the invention.

Figure 2 is a vertical section therethrough from front to rear on a somewhat enlarged scale.

Figure 3 is a view taken in section on the line indicated at 3—3 in Fig. 2.

Like parts are identified by the same reference characters throughout the several views.

The cabinet 4 houses all of the apparatus required for developing X-rays and employing them for inspection purposes. In the base is a case 5 which houses the transformer 6 and is preferably liquid-tight to contain an oil bath for cooling the transformer. Copper tubing is arranged in coils 7 and 8 leading from top to bottom of the case and the oil circulating through these coils, which thus serve as radiators for the dissipation of heat delivered to the oil by the transformer.

The transformer leads are carried upwardly through insulators 9 to the X-ray tube 10 which preferably has a sheath 11 of lead or lead glass windowed at 12 for the delivery of the rays to be used. The tube and sheath assembly is mounted in a conical protective screen 13 which flares upwardly and is made of lead or the like to prevent the X-rays from passing to any part of the apparatus other than that in which the articles requiring inspection are placed. The weight of the protective screen 13 and the tube and sheath assembly may conveniently be carried by a support 14 which extends across the cabinet from front to rear.

The articles to be viewed are placed upon a shelf

15 which is preferably slidable in suitable channels 16 to facilitate the placement of the goods to be inspected. The goods are receivable into the cabinet through a door opening 17 which may be closed by a door 18. The door is preferably lined with lead at 19 for the protection of the operator.

A hinge 20 connects the door with the cabinet, and a strap 21 carried by the door is engaged in a slot 22 in the sliding shelf 15, so that the shelf will move outwardly as the door is opened and will be caused to move inwardly when the door is closed. While any desired means for operating the door may be employed, it is preferred to use a link 23 and a foot treadle 24 pivoted on a stand 25.

The particular device disclosed is adapted to receive four shoes at once. In order to position the shoes with sufficient accuracy so that they may all be inspected simultaneously, I prefer to employ the quarter round positioning guides 30. These may be covered with felt to avoid possibility of injuring the finish of the shoes.

Partitions 31 extend upwardly above the slidable shelf 15 to define the receiving chamber for articles to be inspected. At the top of this chamber is a guideway formed by angles 32 in which a frame 33 is removably supported to fix the position of a replaceable fluoroscopic screen 35. The frame may be withdrawn through the door opening 17 as shown in Fig. 2.

That portion of cabinet 4 above the screen constitutes a viewing chamber. The top of the cabinet carries an eye piece at 36 through which all portions of screen 35 are visible.

The door 18 will normally be allowed to remain open, thus holding the slidable shelf 15 in its outwardly extended position pending the positioning of the shoes thereon. As the door 18 is closed, the shoes move inwardly on shelf 15 between the positioning guides 30. As the door reaches its closed position a link 37 connected therewith closes switch 38 which may operate the transformer 6 directly, but preferably merely closes a low voltage circuit from wire 39 to wire 40, and thence through the electromagnet 41 to wire 42 and back to the source of current at 43. The electromagnet 41 attracts the relay switch 44 which comprises its armature, and thereby closes circuit from the source of current 43 through wire 39 and shunt 45 to wire 46 which is one of the supply leads to the transformer, the return lead being designated at 47. It will, of course, be understood that the illustration of the electrical connections is purely diagrammatic.

Each time the door 18 is closed the work is moved into position and the electrical connections are energized to operate the X-ray tube 10. The minute the door is opened the X-ray tube is de-energized. This arrangement affords substantial and greatly needed protection for the operator.

The device may be operated with great rapidity since the sliding shelf facilitates placement and removal of the shoes, the cushioned guides 30 position the shoes without injury, and the disposition of the parts is such that the operator need not leave his position to place and remove the shoes and to inspect them when the door is closed. The fact that the switch is mechanically operated upon the closing of the door is also a factor in speeding up the operation of the machine.

It will be understood by those skilled in the art that other forms of penetrating rays may be employed instead of X-rays without departing from the spirit of this invention, and that other screens sensitive to the rays employed may be used as substitutes for the fluoroscopic screen described because of its familiar application to the purpose. Other shielding than lead may also be substituted if desired. The above terms wherever used throughout the specification and claims are to be understood to include equivalent substitutes.

I claim:

1. An inspecting device comprising a cabinet provided with a door, a work receiving shelf within the cabinet, a fluoroscopic screen and an X-ray tube disposed at opposite sides of work to be received on said shelf, and means for energizing said tube upon the closing of the door, together with a treadle operatively connected with said door for the actuation thereof.

2. An X-ray inspecting device comprising the combination with a cabinet having a door and a viewing chamber above the door, of a fluoroscopic screen at the bottom of said chamber, a support slidable in said cabinet in spaced relation below said screen and accessible through said door, an X-ray tube below the support, and guide means at opposite sides of the support for positioning above said tube articles carried by said support in the sliding movement thereof.

3. X-ray inspection apparatus comprising the combination with a movable work support, of means comprising with said work support a work chamber, and including a fluoroscopic screen at one side of the path of movement of said support, an X-ray tube below said screen, and a viewing chamber above said screen and adapted to exclude light extraneous to said apparatus, together with means mechanically operable upon the movement of said support for energizing said tube.

4. X-ray inspection apparatus comprising a cabinet subdivided in part by a work receiving shelf and a superposed fluoroscopic screen into a work receiving chamber and a superposed viewing chamber, said cabinet having a ray generating tube below the shelf and means for intercepting the generated rays on all sides except that occupied by the shelf, in combination with a ray intercepting door for the work receiving chamber, a

source of energy for actuating said tube, connections from said source to said ray generating tube, a switch interposed in said connections for controlling the energization of said ray generating tube, and means associated with said shelf for transmitting door closing movements to actuate said switch.

5. X-ray inspection apparatus comprising the combination with a movable work support, a shielded X-ray tube at one side of the path of movement of work carried by said support, a fluoroscopic screen at the other side of said path, relatively fixed guiding means for positioning work on said support, a viewing chamber adapted to facilitate inspection of such work, and a door provided with a ray intercepting ply and adapted to serve as a lever for moving said support from work receiving position to work inspecting position during a closing movement of the door, said door also controlling the application of electrical energy to said X-ray tube during its closing movement, whereby to protect operators handling the work from exposure to the rays by requiring closure of the door preparatory to generation of such rays.

6. In an X-ray work inspection cabinet, the combination with an electrically operated ray generating tube, of a movable work support in said cabinet, a fluorescent viewing screen above said work support, a ray intercepting door affording access to the work support and adapted to serve as a lever to actuate the same, and switch mechanism operable by said support to close the energizing circuit of said tube when the support is actuated by the door in a door closing movement.

7. An inspecting device comprising a cabinet, said cabinet having mounted therein an X-ray tube, a fluorescent screen and an intermediate support for articles to be inspected, a ray intercepting door controlling access to the interior of said cabinet and through which the articles to be inspected may be placed upon said support, a source of energy for said X-ray tube, switch mechanism controlling delivery of said energy to the tube, said switch mechanism being linked to the support and said support in turn being movable in correspondence with movements of the door and adapted to transmit movement from the door to the switch through such linkage to close the switch during the closing movement of the door.

8. An inspecting device comprising a cabinet having mounted therein and X-ray tube, a fluorescent screen and an intermediate movable work support, a door controlling access to that portion of the interior of said cabinet which contains the work support, said support being connected with the door to be partially withdrawn when the door is opened to facilitate substitution of articles to be inspected, a source of energy for said X-ray tube, and means for connecting said source of energy with the tube when the door is closed.

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