Jan. 6, 1953 M. N. FAIRBANK 2,624,253

PROCESSING APPARATUS FOR RADIATION DETECTION DEVICES

Filed Nov. 14, 1951

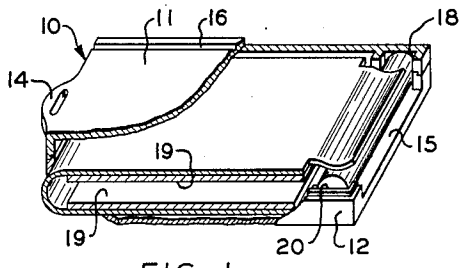

FIG. 1

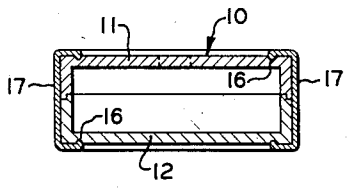

FIG. 2

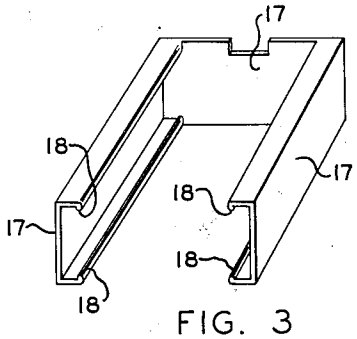

FIG. 3

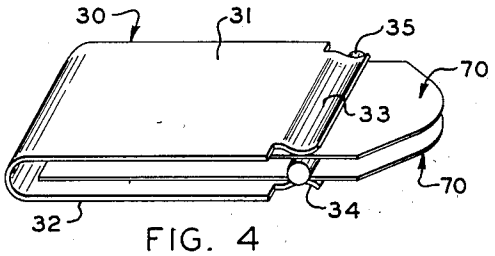

FIG. 4

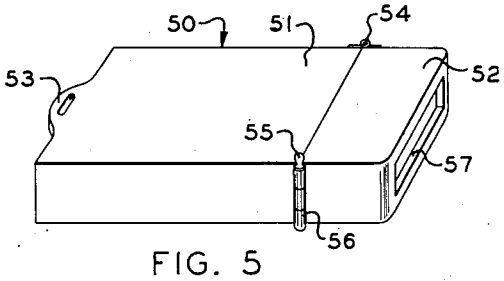

FIG. 5

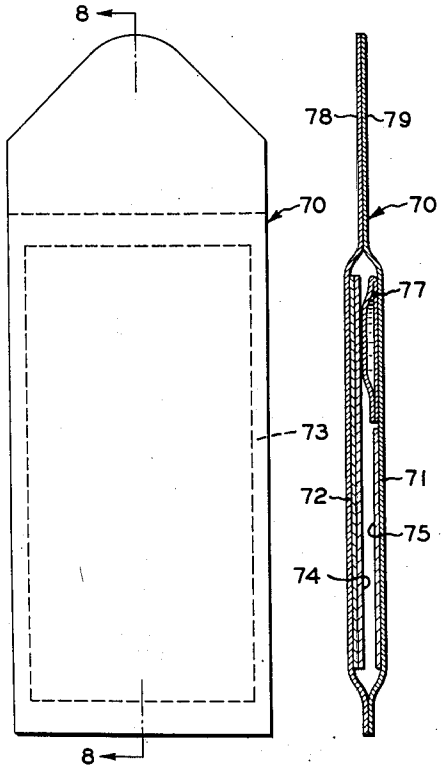

FIG. 7

FIG. 8

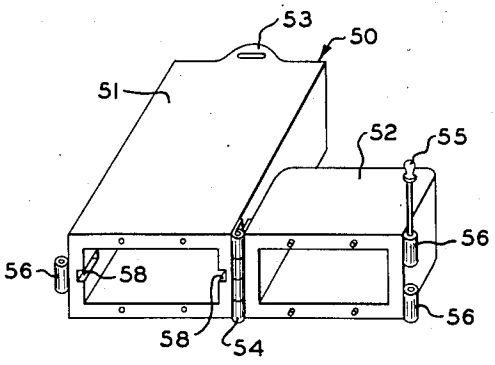

FIG. 6

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PROCESSING APPARATUS FOR RADIATION DETECTION DEVICES

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Application November 14, 1951, Serial No. 256,263

9 Claims. (Cl. 95—89)

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This invention relates to apparatus for processing radiation-sensitive products in the nature of dosimeters of the character which utilize photosensitive materials for detecting, indicating, recording and measuring such radiation.

One embodiment of dosimeter which is particularly adapted for processing by the devices set forth herein makes use of a releasably sealed envelope which carries within its interior photographic materials, including a photosensitive element and a rupturable container holding a photographic processing composition. The wall members of the envelope are substantially impervious to actinic light, liquid and vapor but are formed of materials which will transmit the nuclear radiation to be detected. Processing of a dosimeter of this character is effected by the application of pressure to opposite sides of the envelope in a manner to effect the rupture of the container therein and the appropriate spreading of its discharged liquid within the envelope.

Objects of the invention, which, as noted, is concerned with means for processing photosensitive dosimeters of the character described as individually comprising a lighttight envelope enclosing at least a photosensitive element and a rupturable container holding a liquid composition, reside: in the provision of a simple, inexpensive and lightweight processing apparatus or device making use of a box type of container structure having an opening through one end thereof and employing spring-loaded, pressure-applying means insertable within said box and simultaneously engageable in pressure contact with the opposite sides of two dosimeters and between which the envelope of each dosimeter is individually movable upon pulling each envelope therebetween whereby to effect the rupture of the container within the dosimeter envelope and the spreading of its liquid content, and wherein means are associated with the box for removably mounting the spring-loaded means therein in operative alignment with the opening in the box so as to permit each dosimeter to be manually engaged and pulled between said pressure-applying means and to be withdrawn from said box; in the provision of dosimeter processing apparatus employing pressure-applying means in the form of a pair of overlying and spring-loaded arms which are removably mounted within a processing box for applying pressure to the opposite sides of a dosimeter envelope, particularly spring-loaded means in the form of a U-shaped spring clip with which a rounded rod or cylindrical member is associated for mounting

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between the free ends of the arms of said clip; and in the provision of dosimeter processing apparatus of the character described making use of a box having a door or a removable portion to permit the mounting within the box of said spring-loaded, pressure-applying means having a pair of dosimeters engaged therebetween.

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

The invention accordingly comprises the apparatus possessing the construction, combination of elements and arrangement of parts which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

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

Figure 1 is a perspective view of one embodiment of dosimeter processing apparatus making use of a box-type structure and shows the apparatus with parts thereof removed and parts broken away to detail the interior of the box and the means therein for applying pressure to the opposite sides of a pair of dosimeters;

Fig. 2 is a transverse sectional view taken centrally of the box of Fig. 1 in assembled condition and with the processing means removed from the box;

Fig. 3 is a perspective view of a retainer member for holding the box of Fig. 1 in closed condition;

Fig. 4 is a perspective view of the spring-loaded, pressure-applying means usable with all embodiments of the invention for applying pressure to the opposite sides of each of a pair of dosimeters and diagrammatically discloses a pair of dosimeters mounted within and engaged between the spring-loaded, pressure-applying means;

Fig. 5 is a perspective view of another embodiment of dosimeter processing apparatus with which this invention is concerned and illustrates the outside of the apparatus;

Fig. 6 is a perspective view, with parts removed from the processing box of Fig. 5, and shows the box in open condition;

Fig. 7 is a plan view of an envelope dosimeter of the type with which the processing apparatus of Figs. 1 and 5 are usable; and

Fig. 8 is a sectional elevation taken along the line 8—8 of Fig. 7.

While the present invention is unconcerned with radiation detection devices per se, it is

nevertheless believed that a description of the construction of a dosimeter will assist in understanding the nature, operation and utility of the processing devices disclosed in Figs. 1 through 6 of the drawings. One embodiment of dosimeter which is particularly adapted for processing by the apparatus set forth herein is indicated by the general reference numeral 10 in Figs. 7 and 8 and comprises an envelope formed of outer wall members 11 and 12 which are releasably secured together by means of a strippable adhesive bond along the longitudinal edges thereof and also transversely of the wall members at one end thereof, as well as at a position preferably, although not necessarily, somewhat from the other end. This bond is adapted to provide a seal between the layers which is impervious to liquid and to light of a wavelength actinic to photosensitive materials within the envelope 10 and is shown in Fig. 7 at 13 as extending over an area lying between the rectangular marginal outline of the envelope as therein illustrated and the dotted line parallel to said outline. By this arrangement it will be apparent that each layer 11 and 12 providing a wall member will have a portion at one end which is unconnected to the other wall member. These portions 18 and 19, in the form of extensions, are in fact leaders which provide means to facilitate handling of the photosensitive unit, as well as means to assist in stripping the layers so that they may be placed in spread-apart condition after processing.

The envelope wall members 11 and 12 are each formed of a sheet material which is substantially impervious to actinic light, liquids and vapor, while being capable of transmitting nuclear radiation to be detected, i. e., shorter wavelength radiation including X-rays and gamma rays. A print-carrying or print-receiving element 15, a rupturable container 17 for a liquid processing composition and a photosensitive element 14 are located within the interior of the envelope and are suitably secured to the inner surfaces of the wall members 11 and 12, as shown in Fig. 8. Photosensitive element 14 comprises one or more strips of a photosensitive material, such as silver halide, while the print-carrying element 15 may comprise a suitable sheet material, such as baryta paper. In the arrangement shown, the print-carrying element 15 is in superposed relation with the portion of the photosensitive element 14, while container 17 is located adjacent the end of the print-carrying element 15 which is positioned the nearest to the leader means of the dosimeter envelope.

A substantially liquid-impervious sheet material, similar to that used for forming the envelope wall members 11 and 12, is employed for container 17 whereby the container is adapted to hold a processing liquid. One example of a processing liquid usable for carrying out a silver halide transfer process comprises a silver halide developer and a silver halide fixer, both in solution in the liquid. The container 17 is positioned to extend transversely of the print-carrying element 15 and is provided with a rupturable seal adjacent the print-carrying element whereby pressure applied to opposite sides of the dosimeter envelope will effect the rupture of this seal and the discharge of the liquid content of the container for spreading between and in contact with the superposed print-carrying element 15 and the photosensitive element 14.

For processing purposes, the dosimeter, as noted, may be drawn between pressure-applying means by pulling on the leader means 18 and 19 of the dosimeter whereby the container end of the dosimeter may conveniently be termed the "leading end" thereof and the opposite end of the dosimeter may be termed the "trailing end."

Dosimeters of the character illustrated in Figs. 7 and 8 are intended to utilize a photographic transfer process in determining the extent to which the dosimeter has been acted upon by nuclear radiation of the type to be detected. As previously pointed out, the nuclear radiation to be detected will penetrate through the envelope. Radiation of this character will form latent image in the photosensitive materials of the photosensitive element 14. The processing liquid, when spread between and in contact with the print-carrying element and the photosensitive element, is adapted to develop latent image in the photosensitive element to silver and to form, by transfer, a reverse print thereof on the print-carrying element. Following formation of the reverse image, the envelope layers are peeled or stripped apart. The density of the transfer image is utilized to determine the extent of radiation dosage received by the dosimeter by comparing this density with a standard which is representative of print densities obtained by exposing photosensitive materials similar to those employed in the dosimeter to predetermined dosages of nuclear radiation.

The principles of a transfer process, as well as film structures and dosimeters suitable for use in the invention, are set forth in United States Patent No. 2,543,181, issued February 27, 1951, to Edwin H. Land for Photographic Product Comprising a Rupturable Container Carrying a Photographic Processing Liquid, application Serial No. 652,612, filed March 7, 1946, by Edwin H. Land for Liquid-Carrying Container and application Serial No. 218,042, filed March 28, 1951, by Murry N. Fairbank and William A. Shurcliff for Radiation Detection Devices. The last-noted application is specific to dosimeter constructions of the general nature of the dosimeter illustrated in Figs. 7 and 8 herein. Patent No. 2,543,181 and said copending applications include detailed descriptions of film units comprising a photosensitive element and a print-carrying element which are adapted to contain all of the photographic materials needed to process the unit. Also, the just-mentioned patent and copending applications are detailed as to containers for holding processing materials and further include descriptions of liquid processing compositions usable with such units. The practices, photographic materials and compositions described in said Patent No. 2,543,181 and said copending applications are generally suitable for carrying out the present invention and special reference to the details thereof are made in said patent and copending applications.

The dosimeters described herein are intended to be carried on the person and to be processed at the instant that the possessor of the device wishes to determine if he has been subjected to unsafe radiation conditions. Consequently, the dosimeters are relatively small. For example, the complete envelope in the embodiments heretofore disclosed may have dimensions of about 3 inches by 1 inch or even smaller.

Under the just-noted circumstances wherein the dosimeter is literally intended to be processed at an instant's notice, it is desirable to provide processing means of simple and light-weight construction for association with the dosimeter.

Preferably, the processing apparatus or device should be of a size and weight such that it may be carried on the person, as by attachment to an article of clothing, or by suspension around the neck from a ribbon or cord as in the case of the so-called military "dog tag," or even carried in a pocket. It is desirable that such an apparatus, in addition to providing processing means, should also serve several other functions.

For example, the processing apparatus should be in the nature of a holder or carrier for storing or holding one or more dosimeters. Likewise, the processing holder should be able to protect the stored dosimeters from dirt, moisture, such as perspiration, and the like, while guarding each dosimeter carried therein against the application of forces which would rupture the liquid container of said dosimeter and while maintaining the dosimeter in a generally flat condition ready for use. In addition, the holder should provide means for shielding the dosimeter from soft rays which might prematurely expose photosensitive materials within the dosimeter envelope.

One embodiment of apparatus for processing a dosimeter of the character with which this invention is concerned is generally indicated in Figs. 1 and 2 by the reference numeral 10 and comprises a rectangular box type of housing or structure which is closed at one end and open at the other and which is adapted to have spring-loaded pressure-applying means 30, such as those detailed in Fig. 4, removably mounted or housed therein.

The housing of the apparatus 10 comprises a top portion 11 and a bottom portion 12 having side and end flanges whereby the portions 11 and 12 may be seated on each other to provide the box type of structure. As shown in Figs. 1 and 2, one end of the box is closed when the top and bottom portions are in seated relation while the other end is provided with an opening 15. The closed end of the box may be termed the "trailing end" thereof and the end with the opening 15 may be termed the "leading end." Top and bottom portions 11 and 12 may be provided with suitable indexing pins and recesses (not shown) in the flanges thereof whereby to facilitate registration of the box portions.

Means for securing the top and bottom portions 11 and 12 in superposed box-forming relationship makes use of a pair of channels or grooves 16 which are formed in the outer surface of the body of the top and bottom box portions 11 and 12 to extend longitudinally thereof adjacent each long side of the box. These channels 16 are adapted to receive the flanges 18 provided on spaced-apart, substantially parallel arms of a U-shaped retainer or keeper member 17 (Fig. 3) which is slidably engageable with the sides and trailing end of the box formed by seating the top and bottom box portions 11 and 12 on each other. Fig. 2 shows the top and bottom portions 11 and 12 assembled to form the box type of structure and secured together by the retainer member 17 which is adapted to snugly engage said top and bottom portions 11 and 12.

Additionally, the top portion of the box 11 may be provided with an extension 14 having an opening therein for receiving a cord or ribbon adapted to allow the apparatus 10 to be suspended from the person.

The housing for the apparatus 10 may have the box-forming portions 11 and 12 thereof constructed from any suitable material, preferably an organic plastic material, or they may be constructed of wood or suitable composite material or even light-weight metal, such as aluminum. The retainer or keeper 17 may be formed from similar materials.

In Fig. 4, there is disclosed spring-loaded means which are used in applying pressure to the opposite sides of a dosimeter envelope to effect the processing of the dosimeter upon pulling the envelope between the pressure-applying means. These spring-loaded means 30 are shown in the form of an elongated U-shaped spring clip having overlying arm portions 31 and 32 which have a length from their free ends to the curved portion forming the base of the U-shaped clip somewhat less than the length of a dosimeter to be processed. In width, each arm 31 and 32 is approximately equal to and preferably slightly greater than the width of the dosimeter. Arms 31 and 32 are constantly urged toward each other by the nature of the construction of the spring clip. The clip may be made of any suitable spring metal.

Additionally, arms 31 and 32 at their respective free ends are each formed with a similarly rounded or generally curved portion indicated by reference numerals 33 and 34, respectively. When viewed from the outer surface of each arm 31 and 32, each curved portion is of concave shape, while the inner surfaces of the curved portions are convex whereby the arms 31 and 32 protrude toward each other at their free ends and in effect provide rounded jaws. These curved portions 33 and 34 extend fully across each arm and are located transversely of the arms. The curved portions 33 and 34 each provide one spreading or pressure-applying surface of two pairs of spreading surfaces utilized for processing a pair of dosimeters adapted to be mounted between the arms 31 and 32 of the clip 30.

The other pair of spreading surfaces utilized by the pressure-applying means comprise opposed surfaces of a rounded rod or cylindrical member 35 which is adapted to be engaged between the free ends of the arms 31 and 32 in alignment with the spreading surfaces of the curved portions 33 and 34. The rod or cylindrical member 35 is of suitable metal and is of such length that a portion at each end thereof will extend beyond the sides of the spring clip for a purpose which will presently appear. It will be apparent that the clip will be fully spring-loaded when the rod or cylindrical member 35 is positioned between the convex surfaces of the curved portions 33 and 34 of the arms of the clip. Inasmuch as the pressure needed for processing a dosimeter will be of the order of from two to five pounds, it will also be appreciated that the spring clip may be manually separated for insertion of the rod or cylinder 35 between the jaws thereof.

The spring clip of the pressure-applying means 30 is intentionally given a length dimension which is generally equal to the length of a dosimeter from the trailing end thereof to a location which lies intermediately between the ends of the leader means 78 and 79, i. e., a position in advance of the container 77. This permits a pair of dosimeters to be inserted within or between the overlying arms 31 and 32 of the spring clip so that the trailing end of each dosimeter is located adjacent the curved base of the U-shaped clip and so that a portion of the leader means 78 and 79 is engaged between the spring-loaded pressure-applying surfaces 33 and 34 and op-

posed surface portions of the rod or cylindrical member 35 with a portion of the leader means extending beyond the free ends of the arms 31 and 32 of the spring clip. This positioning of a pair of dosimeters within the spring-loaded pressure-applying means 30 is particularly well shown in Fig. 4, where, as illustrated, the dosimeters are located in overlying relation to each other and have their longitudinal axes generally parallel to the longitudinal axes of the arms 31 and 32 of the spring clip.

Operation of the processing device 10 will now become apparent. In explaining this operation, it is assumed that the device is in unassembled condition and that all parts are completely separated from each other. A pair of dosimeters 70 are readily positioned within the pressure-applying means 30 by manually forcing apart the free ends of the spring clip and inserting the dosimeters between the overlying arms 31 and 32 thereof so that the envelope of each dosimeter has its trailing end adjacent the curved base of the U-shaped clip. The rod or cylindrical member 35 is then placed between the two dosimeters and will be held in position by the loading of the spring arms 31 and 32 of the clip, the surface of the dosimeter envelopes developing sufficient friction with the cylindrical member to allow it to be held in engagement by the curved portions 33 and 34 of the clip ends. Each dosimeter mounted within the clip will have a surface located adjacent one of the arms of the clip and will be engaged between a curved portion 32 or 33 and a portion of the rounded surface of the cylindrical member 35. In mounting the cylindrical member 35, care should be exercised to position it so that it extends beyond each side of the U-shaped clip by substantially the same amount and so that the longitudinal axis of the cylindrical member extends generally transversely of the clip arms 31 and 32.

With a pair of dosimeters mounted within the pressure-applying means as just described, these means 30 may be seated within the bottom portion 12 of the boxlike housing structure. It may be observed that each side wall of the bottom portion 12 of the box structure is provided with recesses 20 whereby to receive the ends of the cylindrical member 35 for the purpose of retaining it in operating relation to the pressure-applying means 30. Similar recesses are formed in the top portion 11 of the boxlike structure. It is unnecessary to so support the rod or cylindrical member 35 in the recesses 20 that it is rotatable, although such practice falls within the scope of the invention.

The boxlike structure provided by the top and bottom portions 11 and 12 is, like the pressure-applying means 30, somewhat shorter than the dosimeters to be processed. As a result, when the pressure-applying means 30, with dosimeters inserted therein, are positioned within the bottom portion 12 of the box, the leader means of each dosimeter will extend through the end opening 15 in the processing box.

With the pressure-applying means 30 mounted in the bottom portion of the box in the manner described, the top portion 11 of the box is seated upon the bottom portion and the retainer or keeper member 17 is engaged, in the manner described, with the top and bottom portions 11 and 12 of the box whereby to retain these portions together.

Processing of a dosimeter proceeds by grasping the processing device 10 in one hand and by then utilizing the other hand to grasp the end of the leader portion of one of the dosimeters 70 which extends through the end opening 15 of the box type of structure. Holding the processing apparatus 10 in this manner, a strong steady pull is exerted on the leader portion whereby to pull the dosimeter entirely between the spreading surface of a clip arm and of the cylindrical member 35. These spreading means exert a sufficient pressure to rupture the container 77 as the dosimeter is drawn therebetween and to cause the discharge of the liquid content of the container and the spreading thereof between the print-receiving element 75 and the photosensitive element 74 whereby to initiate processing of the dosimeter.

After about a minute, the image-forming reactions carried on within the envelope resulting from the rupture of the container and the spreading of its contents are completed. Following this, the dosimeter is peeled apart by grasping the unattached leader portions, one in each hand, and by pulling gently on the unit. An indication or record of the extent to which a person has been submitted to radiation dosage is formed as a transfer print on the print-carrying element of the dosimeter and the silver density thereof is compared with known densities which indicate this extent of radiation dosage.

After the removal from the apparatus 10 of one of the dosimeters in carrying out the processing thereof, the second dosimeter may be allowed to remain in the apparatus until a time when it is desired to determine if the apparatus has been subjected to nuclear radiation. The remaining dosimeter may then be processed in a manner similar to that already described. For re-use, the apparatus is easily taken apart by sliding the keeper 17 off the box structure and separating the bottom and top portions thereof. This permits the pressure-applying means 30 to be removed and unprocessed dosimeters inserted therein.

It is desirable to provide the processing device with shield means to counteract the excessive effect on the photosensitive portions of a dosimeter stored within the holder of soft rays such, for example, as X-rays of long wavelength which have low penetrating power. These shield means comprise a liner of a material tending to attenuate such radiation by an appropriate factor and may comprise lead or cadmium or other heavy metal or alloy. In Fig. 1, shield members 19 are shown as individually carried by the inner surfaces of the arms 31 and 32. They may be fixed to the arms of the U-shaped clip by suitable means, as by screws or other fastenings or by the use of suitable cements and/or adhesives. It is also possible to mount either or both of the shields 19 upon the exterior or within the interior of the top and bottom box portions 11 and 12. The shields 19 are of a generally rectangular shape and have their longitudinal axes centered on the longitudinal axis of arms 31 and 32 of the spring clip. Additionally, each shield 19 is of a width sufficient to cover the photosensitive portion or portions of the photosensitive element and is positioned to carry out this function. If desired, shield means may also be placed along the long sides of the top and bottom portions of the box structure.

Another embodiment of apparatus for processing dosimeters of the character described is generally indicated in Figs. 5 and 6 by the reference numeral 50 and comprises a rectangular box type

of structure 51 which is closed at one end and open at the other and which is adapted to have removably mounted therein the spring-loaded pressure-applying means 30 disclosed in Fig. 4. Box 51 may be constructed of any suitable material such as sheet metal, organic plastics, wood or composite material and may be formed in one piece by molding or casting or may be formed by bending a suitably shaped blank or may be fabricated by securing individual structural members together.

In the embodiment disclosed in Fig. 5, the box 51 is provided at the open end thereof with a closure member 52 which is hinged at one side of the box by conventional hinge means 54 and is adapted to be secured in closed position by a pin 55 engageable with cooperating tubular members or barrels 56 fixed to a side of the box 51 and to a side of the closure member 52. Indexing pins and recesses are illustrated as provided at the open end of box 51 and the inner end of the closure member 52 for registering the latter with the box in closed position.

As may be noted in Figs. 5 and 6, the closure member 52 is hollow and is provided with an opening 57 therethrough whereby to permit the free end of the leader means of one or more dosimeters mounted within the box 51 to extend through said opening and exteriorly of the box and closure member. The interior of box 51, at its open end, is provided with a pair of recesses 58 located along the opposite long sides of the box. These recesses 58 extend inwardly from the open end of the box for a distance at least sufficient to receive the ends of the round rod or cylindrical member 35 of the spring-loaded pressure-applying means 30. Box 51 is shown as provided with an extension 53 having an opening therein for a suspension cord, ribbon or the like.

Operation of the apparatus 50 is similar to that of the apparatus 10. In the case of the apparatus 50, the closure member 52 is unfastened by withdrawing the pin 55 and the closure member is then swung to the open position shown in Fig. 6. The spring clip of the pressure-applying means, with a pair of dosimeters inserted between the arms of the clip and the cylindrical member 35 in mounted position, is then inserted within the box 51, with the curved base of the U-shaped clip positioned for location at the closed end of the box. Following this, the closure member 52 is swung to its closed position, with the leader means of each dosimeter extending through the opening 57, and the closure member 52 is fastened, after which each of the dosimeters may be processed by manually withdrawing them from the apparatus.

From the foregoing it will be appreciated that the apparatus forming the subject of this invention accomplishes the aims and objects of the inventive concept. Each apparatus disclosed herein is of lightweight construction and is relatively small whereby it may be carried on the person. In addition, it is of a simple character that permits several dosimeters to be simultaneously stored and individually processed at an instant's notice. Furthermore, dosimeters stored in the apparatus are adapted to be protected from dirt and moisture, as well as from forces which would tend to rupture the container within the dosimeter envelope due to the fact that, with the exception of a small portion of the leader means, each dosimeter is enclosed in the apparatus. Since these leader means are flexible, the portion thereof which extends from the apparatus during storage of a dosimeter may be subjected to considerable bending before a dosimeter mounted within the apparatus becomes seriously damaged. Additionally, the apparatus of the invention permits means for shielding dosimeters stored therein from soft rays which might prematurely expose the photosensitive materials within the dosimeter envelope.

Since certain changes may be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limting sense.

What is claimed is:

1. In apparatus for at least processing photosensitive dosimeters, each of the type having at least a photosensitive element and a rupturable container holding a liquid processing composition located relative to each other so that liquid discharged from said container may be spread over said photosensitive element, and wherein said photosensitive element and said container are carried in an elongated envelope provided with leader means at one end thereof to assist in handling and processing said dosimeter, in combination, a box type of structure having an opening through one end thereof, spring-loaded pressure-applying means, insertable in said box and adapted to have the leader means of a pair of dosimeters simultaneously engaged therebetween and extending therefrom and between which each dosimeter is individually movable upon pulling on the leader means thereof, for applying sufficient pressure to the opposite sides of each dosimeter to effect the rupture of the container and the spreading of its liquid content within said envelope as said dosimeter is pulled through said spring-loaded pressure-applying means, and means removably mounting said spring-loaded pressure-applying means in said box in operative alignment with said opening in the end of said box, whereby the leader means of each dosimeter envelope which is engaged by said spring-loaded pressure-applying means extends within said opening in said box for individual manual engagement.

2. Apparatus as defined in claim 1 wherein the spring-loaded means for applying pressure to the opposite sides of the dosimeter includes an elongated spring clip having two relatively wide overlying arms.

3. Apparatus as defined in claim 1 wherein said spring-loaded pressure-applying means comprises an elongated U-shaped spring clip and a rounded rod member removably engaged between the free ends of the arms of said U-shaped clip and in pressure bearing with said arms, whereby one dosimeter is positionable between the overlying arms of said clip for engagement between one arm and said rod member and a second dosimeter is engageable between the other arm and said rod member.

4. In apparatus as defined in claim 1, spring-loaded means comprising an elongated U-shaped spring clip having arm portions which are constantly urged toward each other, a rounded rod member removably engageable between the free ends of said arms and held therein by pressure contact of said arms, said rod member being located transversely of said arms and extending beyond opposite edges of each said arm.

5. Apparatus as defined in claim 4 wherein said box is provided with a recessed portion in op-

posite sides thereof adapted to removably receive the ends of said rod member.

6. Apparatus as defined in claim 1 wherein said spring-loaded pressure-applying means comprises an elongated U-shaped spring clip, each arm of said U-shaped clip at the free end thereof having a rounded portion which extends transversely of said arm and toward the other arm of said clip whereby to provide rounded surfaces for applying pressure to each dosimeter engaged by said spring-loaded pressure-applying means.

7. Apparatus as defined in claim 6, including a rounded rod member removably engageable between the free ends of the arms of said U-shaped clip.

8. Apparatus as defined in claim 1 wherein said

box comprises a top portion and a bottom portion superposable upon each other and means for securing said top and bottom box portions in superposed relation.

9. Apparatus as defined in claim 1 wherein said box is provided with a closure member at the open end thereof, said closure member being hollow and having an opening at one end thereof for alignment with the open end of the box, and means for securing said closure member to the end of said box with said opening in the closure member aligned with the open end of said box.

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No references cited.