United States Patent [19]

Hedin

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[45] **Dec. 11, 1973**

[54] **X-RAY FILM**

[75] Inventor: **Milton W. Hedin**, Saint Paul, Minn.

[73] Assignee: **Minnesota Mining and Manufacturing Company**, Saint Paul, Minn.

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[21] Appl. No.: **233,502**

Related U.S. Application Data

[63] Continuation of Ser. No. 97,731, Dec. 14, 1970, abandoned.

[52] **U.S. Cl.** ..... **206/62 R**

[51] **Int. Cl.**... **B65d 85/46**, B65d 85/48, B65d 85/62

[58] **Field of Search** ..... 206/62 R

[56] **References Cited**

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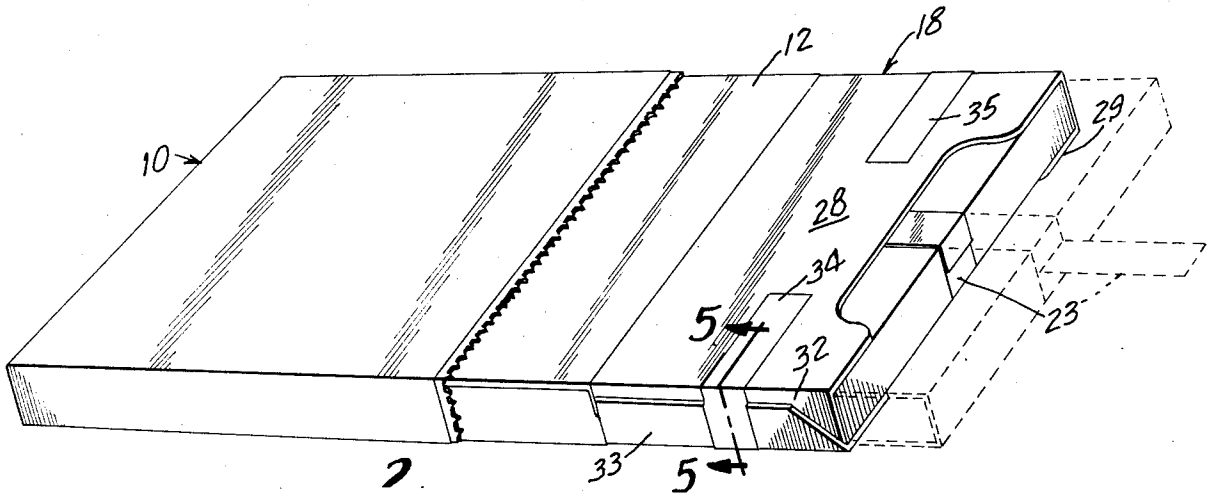
Primary Examiner—William T. Dixson, Jr.

Attorney—John C. Barnes

[57] **ABSTRACT**

A package for X-ray film wherein the sheets of film are in faceTo-face contact and held in a compressed condition within the package to avoid shifting of the sheets during shipment and handling.

5 Claims, 5 Drawing Figures



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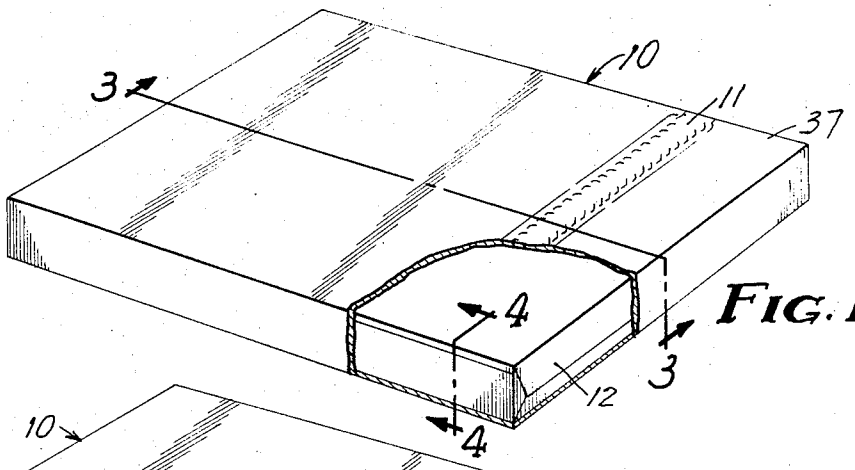


FIG. 1

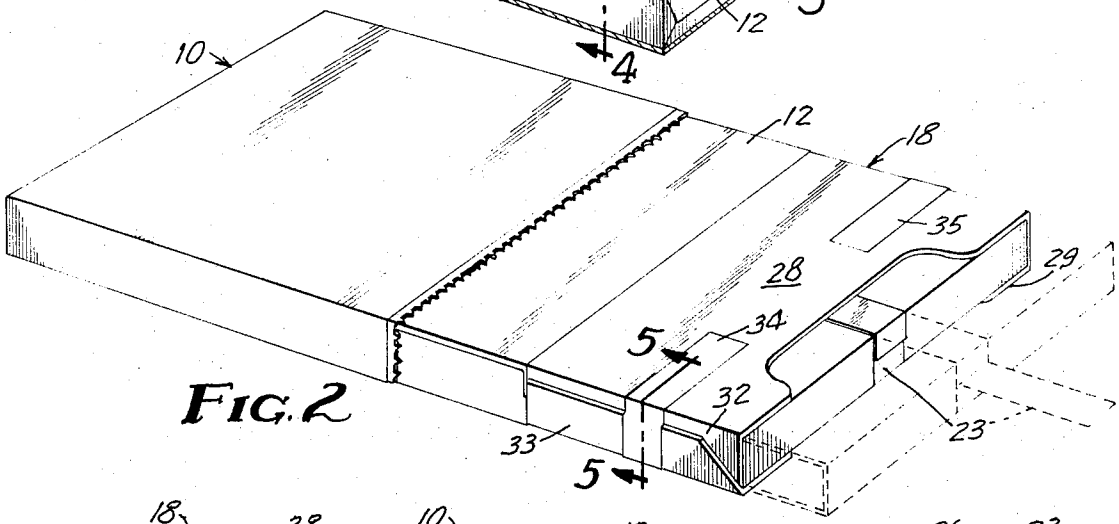


FIG. 2

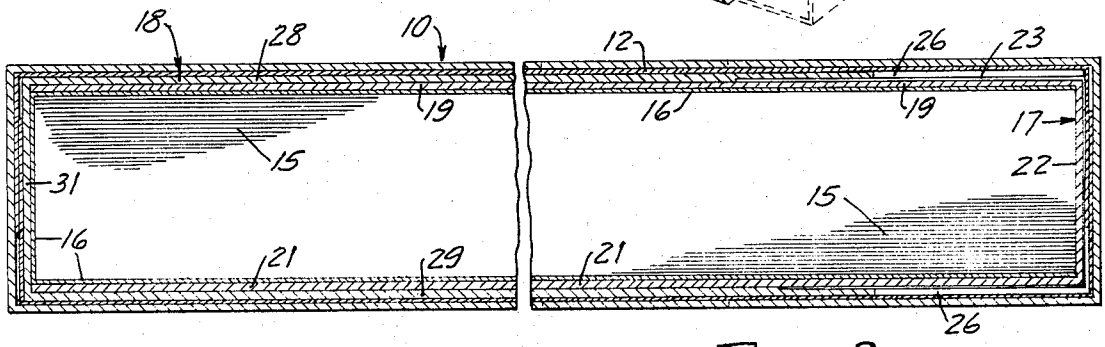


FIG. 3

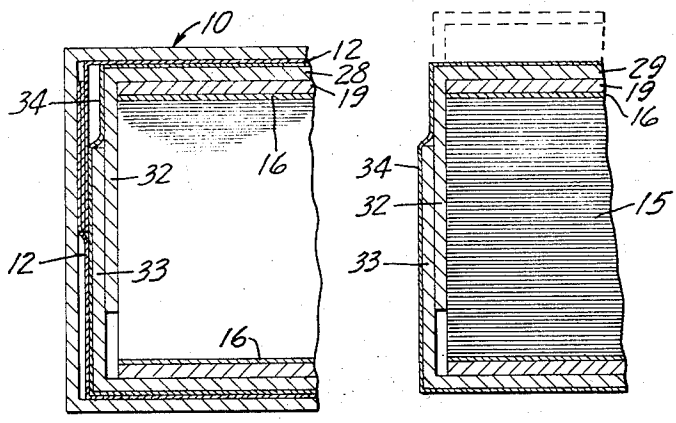


FIG. 4

FIG. 5

INVENTOR.
MILTON W. HEDII
BY Kinney, Alexande
Sell, Steldt & De La Hunt
ATTORNEY.

X-RAY FILM

This is a continuation of application Ser. No. 97,731, filed Dec. 14, 1970 now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to an improvement in a package for X-ray film. The package of the present invention is a construction which securely holds the sheets together within the package and has a removable file placed therearound which upon its removal relieves the compression in the package permitting facile removal of single sheets from a dispensing package.

X-ray emulsions are extremely sensitive to pressure marking. When the emulsions are mechanically stressed, as by microscopic dirt particles being moved across the emulsion, the silver halide grains at those areas are rendered developable and can result in high density marks appearing on the developed film. These discernible marks may thus affect the quality of the X-ray image taken thereon.

It has been popular in the past to interleave sheets of paper between the films to provide a method for cushioning the emulsion. Interleaving has drawbacks including a chemical interaction causing a chemical fog and for the radiologist or X-ray technician the interleaves have been troublesome because soon the X-ray room is filled with the interleaving sheets and handling of these sheets in a busy laboratory is a nuisance. The interleaving sheets also add to the packaging cost.

Approaches to solve this problem may include the development of emulsions having less susceptibility to pressure marking. This approach would require extensive laboratory effort and may be quite difficult to assure that in solving this problem that no other film characteristics would be deleteriously affected. A second solution to the problem may be in providing processing and converting facilities which are completely free from dirt. This approach is of course desirable but may not be attainable and still provide for mechanized converting and packaging facilities. The problem with the microscopic dirt and its effects on the film during shipment was thus the problem needing a solution other than the more direct approaches.

The deleterious effect of the dirt is present primarily during handling, and shipping and U.S. Pat. No. 3,185,298 discloses one package concept for N.I.F. film sheets, i.e., not interleaved film, teaching compressing a stack of film sheets between V-shaped polyvinyl chloride clips. When the package is opened the clip is removed, some film sheets can be released by a short pulling movement whereby the pressure of the other clip or cllps is removed. This action can result in a rubbing between the emulsions and damage sought to be avoided during shipment.

The present invention provides a package which firmly compresses a stack of sheets in face-to-face relation restricting relative movement between the sheets during shipping and a structure to relieve the compression upon opening the package which will avoid mechanical stressing and marking by dirt particles which may be sandwiched between the film sheets during handling for use of the sheets.

The package of the present invention also provides a container permitting storage and easy access to the sheets when the package is opened for use. The package has a removable file about the sheets which is within the package and which, upon its removal, relieves the compression on the film sheets in the stack, and the stack will be held in a shell for the subsequent removal individually, thus removing the likelihood of damaging the emulsion during removal of the film sheets.

The package of the present invention has the X-ray film sheets emulsified on both faces in a stack in face-to-face contact relationship. The stack of sheets is placed in a paper wrapping which may completely wrap the sheets or which may cover the exposed face of the top and bottom sheets in the stack and at one end or edge. The stack of sheets with the wrapping is then placed in a removable file, folded about the stack, and substantially covering the opposed faces of the stack. The file may have a handle taped to the bight portion such that it can be removed from about the stack. The file is placed in a box-like shell having an opening in one end with the open end receiving the stack and file. After the shell is fitted about the stack the shell is compressed to compress the file and the stack of film sheets. Securing means are applied about the opposed edges of the shell to hold the sheets in their compressed position. The securing means is preferably strips of strong fiber-reinforced pressure-sensitive tape having sufficient strength to maintain the stack in a compressed position along the edges thereof. The box-like shell, file and sheets are then placed in a light-tight pouch which preferably includes a metal film. The pouch is then packaged in a box which will bear the appropriate labelling. The box is preferably of an easy-open construction and may be formed with a tear strip around the end thereof coresponding to the open end of the shell and the bight portion of the file.

The present invention and its advantages will be more fully understood after reading the following detailed description which refers to the accompanying drawing wherein:

FIG. 1 is a perspective view of an X-ray film package constructed according to the present invention having portions thereof broken away for purposes of illustrating interior members;

FIG. 2 is a perspective view illustrating the package in a partially open condition and illustrating further opening in broken lines;

FIG. 3 is a fragmentary longitudinal sectional view taken substantially along the lines 3—3 of FIG. 1;

FIG. 4 is a fragmentary transverse sectional view taken along the lines 4—4 of FIG. 1; and

FIG. 5 is a fragmentary transverse sectional view taken along the lines 5—5 of FIG. 2.

Referring now to the drawing the X-ray film package comprises an outer box **10** which will bear the proper labelling and which has opposed ends. A tear strip **11** is formed in the box adjacent one end by appropriately perforating the box board about said one end. The box is otherwise constructed with folded flaps which are adhesively secured together during the packaging process. Within the box **10** and completely enclosing the film in a sealed condition is a pouch **12** which is formed of a laminated material preferrably comprising a uniaxially oriented polypropylene, a metal film (vapor coat) and two 1 mil layers of black polyethylene. This material permits the pouch to be torn across the end and it will not tear lengthwise.

Within the pouch **12**, the film is packaged under compression in a dispensing container which may be removed from the box and pouch. The X-ray film

sheets are packed without interleaves, N.I.F. film, in face-to-face contact. The dispensing container for the stack **15** of X-ray film sheets, each comprising a support sheet or transparent backing coated on each face with a silver halide emulsion, comprises a paper wrapping **16** covering at least one end, and the upper and lower exposed faces of the stack of film sheets, a file **17**, and a box-like shell **18**.

The stack of sheets **15** are wrapped in the paper wrapping **16** which wrapping is preferably dust-free and chemically inert paper. The file **17** has a pair of flanges **19** and **21** and a bight portion **22** and is placed about the wrapping on the stack of sheets. The flanges **19** and **21**, as illustrated, completely cover the opposite faces of the stack of film and necessarily cover the opposite faces of the stack along the longitudinal edges and at one end. The file **17** is formed with a handle **23** which may be formed by folding a length of fiber-reinforced pressure-sensitive adhesive tape back upon itself over a portion of its length and adhering the ends of the tape onto the bight **22** and flanges **19** and **21** of the file **17**. The thin handle **23** affords a trim package and permits grasping the file to withdraw the same lengthwise of the stack of film sheets.

The file **17** and stack of film sheets **15** are contained within the box-like shell **18** formed with an open end as shown to the right in FIG. **2**. Adjacent the open end are cut-back portions **26** permitting first, the grasping of the handle **23** to remove the file **17** and then removal of the film sheets longitudinally from the box-like shell **25** and from the wrapping **16**.

The box-like shell **18** has opposed side panels **28** and **29**, an end **31** and overlapping side flaps **32** and **33** on each edge of the stack (only one edge is shown in FIGS. **2**, **4**, and **5**). The overlapping flaps **32** and **33** extend from the panels **28** and **29** toward the respective opposite panel a distance less than the spacing therebetween even after the stack of sheets, generally **100** sheets, are compressed as illustrated in FIG. **5** by the broken line.

Securing means in the form of strips of fiber-reinforced pressure-sensitive adhesive tape hold the flaps **33** and **32** in contact and hold the panels **28** and **29** in a fixed position relative to each other compressing the panels against the file flanges **19** and **21** and the film sheets between the flanges and against one another. During packaging of the N.I.F. film the film is placed in the wrapping **16**, the file **17** is then folded about the stack, and the box-like shell **18** is folded over the file. The shell **18** is then placed under compression applied against the opposed panels **28** and **29** along their edges, preferably at four locations, to compress the stack of film sheets, wrapping and file between the panels **28** and **29**. While under this compressive loading the strips of fiber-reinforced pressure-sensitive adhesive tape are applied about the edges to the panels **28** and **29** securing the same together. Two of the strips of tape adjacent one end of the shell **18** are shown at **34** and **35**.

The wrapping **16** is positioned about the film sheets such that when the file **17** is being removed there is movement only between the file and the wrapping and not between the wrapping and the film. A suitable coating may be applied to the outer surface of the wrapping or the inner face of the file flanges so the coefficient of friction is less between the file and wrapping than between the wrapping and film sheets. This reduces the possibility of any movement between the wrapping and film which may damage the film if any dirt should be present when the compressive load is removed from the dispensing container.

A strip of lead foil, a quarter inch wide, may be laminated to the underside of one strip of the tape for the purpose of indicating whether or not the film is still suitable for use.

When the operator receives the package **10**, the tear strip **11** is removed to completely remove one end **37** of the box **10**. The operator will then see the end of the pouch **12** and will open the same by tearing it across the end exposing the bight **22** of the file **17** and the open end of the shell **18**. Also exposed is the handle **23** which the operator may grasp to withdraw the file **17** from the shell **18**. As this file is withdrawn the thickness of the flanges **19** and **21** thus relieve the compression placed on the stack of film sheets by the tape strips **34** and **35** permitting the subsequent removal of individual sheets from the stack. The shell **18** and file **17** are constructed of solid unbleached kraft board, scored at the folds and having a thickness of 0.034 inch. The box **10** is formed of clay coated natural kraft board having a thickness of 0.028 inch with folded ends which are sealed with hot melt adhesive.

Having thus disclosed the invention what is claimed is:

1. An X-Ray film package for a stack of X-ray film sheets to restrict any relative movement between the sheets during shipment and handling and affording a package convenient for use by the radiologist which will restrict film damage upon removal of the sheets seriatum therefrom, said package comprising:

a stack of X-ray film sheets with the sheets in face-to-face contact, each sheet comprising a supporting sheet and an emulsion coating on each face thereof,

a paper wrapping on said stack,

a removable file having a flange substantially covering one face of said wrapping and a portion to substantially cover one end of said wrapping,

an open ended box-like shell fitted over said wrapping and file to cover the opposite faces of the wrapping and the opposite end,

securing means holding opposite edges of said shell tightly against the file to maintain the file and the stack of sheets under compression along their edges, and

a light-tight pouch covering said shell, file and wrapped stack of sheets.

2. A package according to claim **1** wherein said file has means adjacent said one end of the wrapping defining a handle permitting it to be easily withdrawn from the box-like shell and from its position in relation to the stack of sheets to relieve the compressive loading on said stack of sheets by said shell and securing means.

3. A package according to claim **1** wherein said file has two flanges to substantially cover the opposite faces of said wrapping and the portion covering said one end has means defining a handle for permitting the file to be withdrawn from said shell to relieve the compressive loading on said stack of sheets.

4. A package according to claim **1** wherein said securing means comprises strips of pressure-sensitive adhesive tape secured to edges of panels forming said shell, which panels cover the opposite faces of said stack.

5. A package according to claim **1** comprising a box enclosing said pouch and having an easily opened end portion disposed adjacent the open end of said shell.

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