# United States Patent

**Huber**

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[45] ***Oct. 17, 1972**


[54] **PHOTOGRAPHIC FILM PACK**


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[ * ] Notice: The portion of the term of this patent subsequent to March 21, 1989, has been disclaimed.

[22] Filed: **Dec. 15, 1971**

[21] Appl. No.: **208,059**

**Related U.S. Application Data**

[62] Division of Ser. No. 785,277, Dec. 19, 1968.

[30] **Foreign Application Priority Data**

Dec. 12, 1967 Germany .....A 57781

[52] **U.S. Cl.** .....**95/22,** 95/13, 96/76

[51] **Int. Cl.** .....**G03b 17/52**

[58] **Field of Search** .....95/13, 19, 22; 96/76



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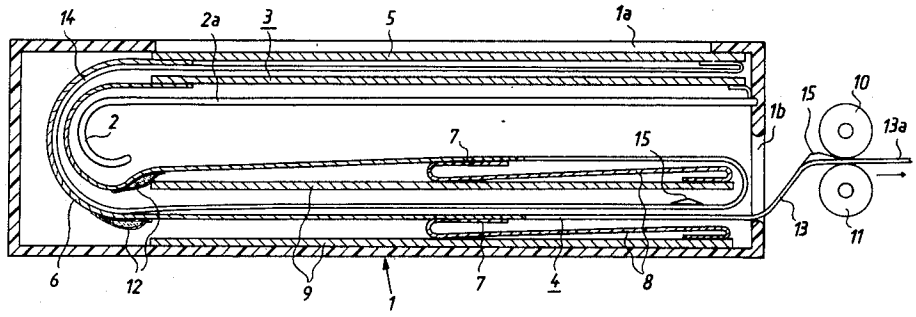
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[57] **ABSTRACT**

Successive film units which are stored in the container of a photographic film pack for use in a camera which develops the film are connected to each other by flexible coupling strips each of which automatically passes between the pressure applying rolls of the camera in response to withdrawal of the preceding film unit. The leading ends of coupling strips are weakened so that they can be readily separated from preceding film units. Such separation is further facilitated by transversely extending or inclined beads provided on the coupling strips and engaging with the pressure applying rolls during separation of respective coupling strips from the preceding film units.


**10 Claims, 5 Drawing Figures**



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SHEET 1 OF 3

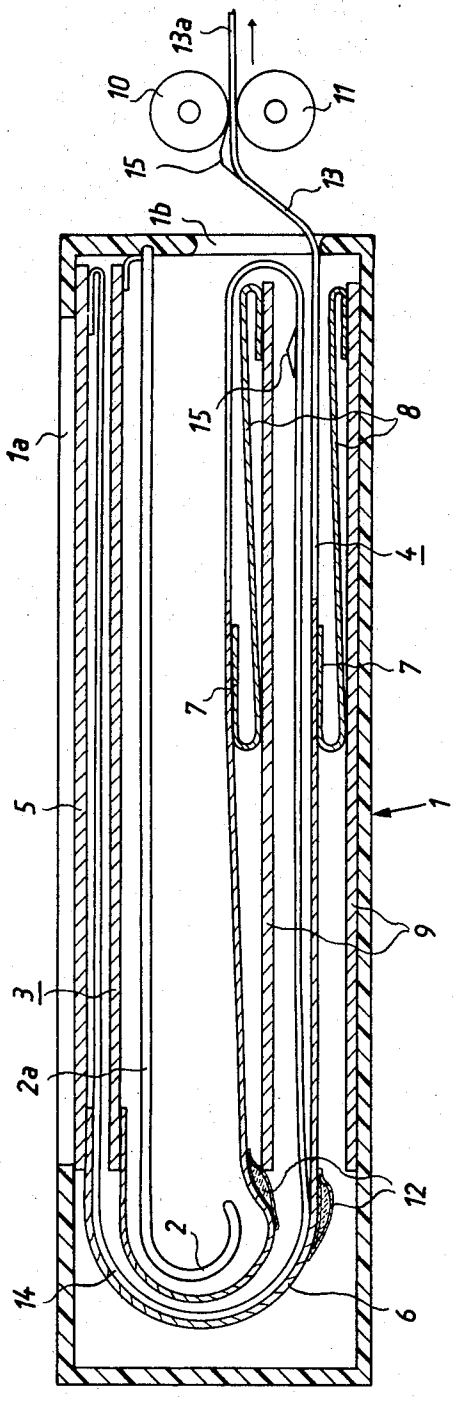



Fig.1

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Fig.2

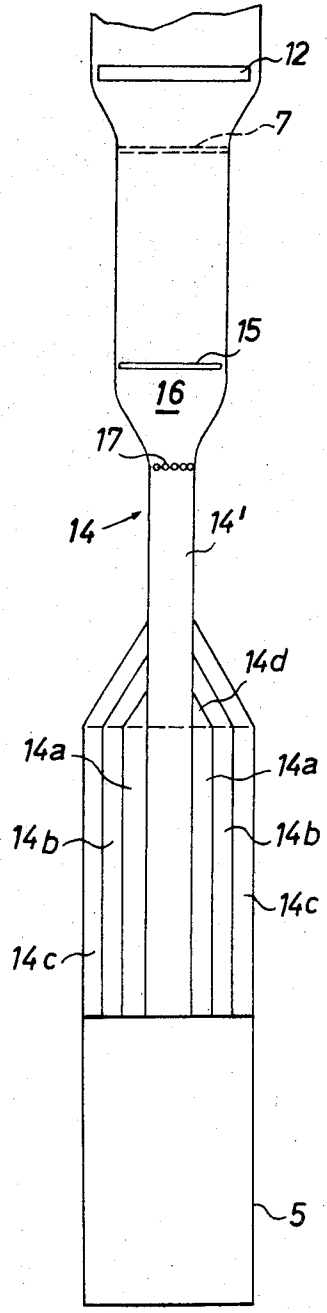
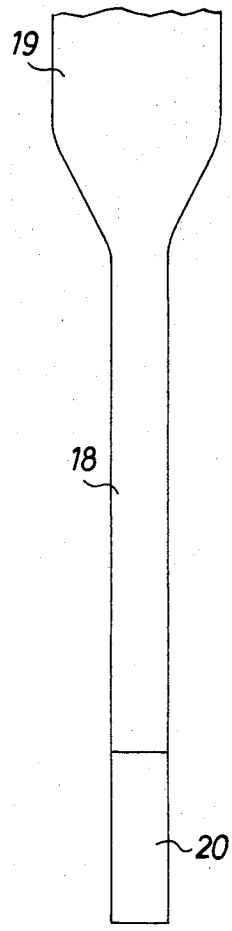



Fig.3




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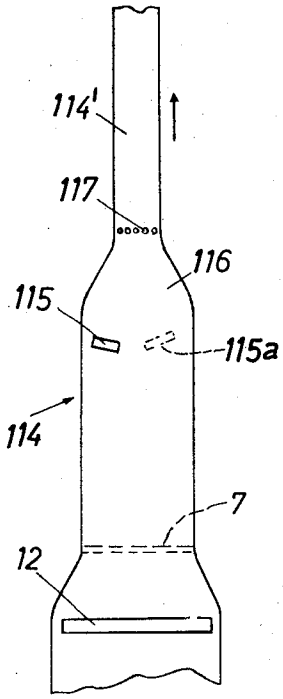



Fig. 4

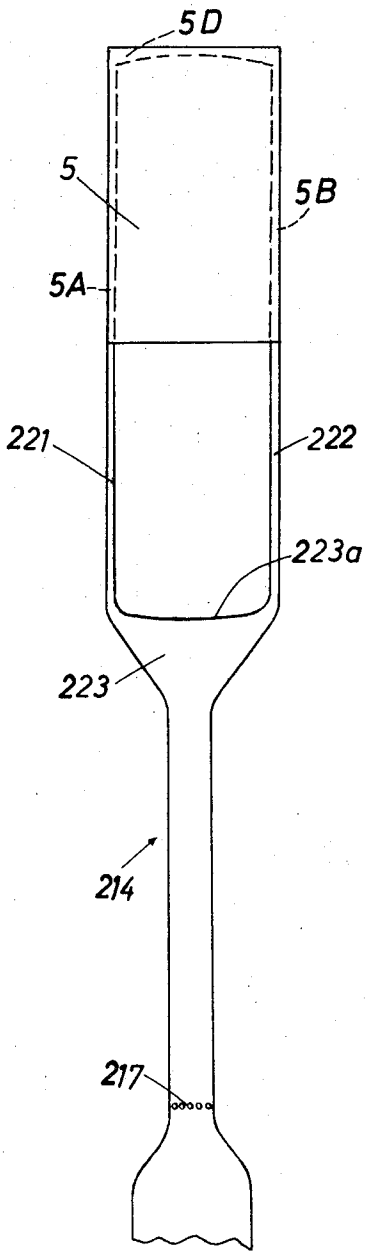



Fig. 5

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# PHOTOGRAPHIC FILM PACK

This is a division of application Ser. No. 785,277 filed Dec. 19, 1968.

## BACKGROUND OF THE INVENTION

The present invention relates to improvements in film packs for use in photographic apparatus which are designed to expose and to immediately develop photosensitive sheets. Film packs for use in such photographic apparatus are described in U.S. Pat. No. 3,161,516 to Hamilton et al.

The patent to Hamilton et al. discloses a film pack wherein a first leader serves to draw a film unit through the nip of two pressure applying rolls which are installed in the body of the photographic apparatus, and wherein a second leader bypasses the pressure applying rolls and is connected to the first leader of the next-following film unit. The purpose of the second leader is to advance the next-following first leader into the nip of the pressure applying rolls so that the corresponding film unit can be withdrawn upon exposure of its photosensitive sheet to scene light. A drawback of such proposal is that the second leader must be separated from the preceding first leader when the next-following first leader enters the nip of the pressure applying rolls. If the user of the photographic apparatus is awkward or if the separation is carried out improperly for another reason, the first leader is retracted from the nip and the film pack must be discarded because the user cannot withdraw the remaining film units. Furthermore, the patented film pack is quite expensive and comprises a large number of parts.

## SUMMARY OF THE INVENTION

One object of my invention is to provide a simple, compact and relatively inexpensive photographic film pack for use in apparatus which develop freshly exposed photosensitive sheets.

Another object of the invention is to provide a film pack which is constructed and assembled in such a way that each removable part of its contents must pass through the nip of pressure applying rolls in the camera.

A further object of the invention is to provide a film pack which can be used in presently known cameras and which automatically places a part of the next-following film unit into a optimum position for withdrawal and development in response to withdrawal of the preceding film unit.

An additional object of the invention is to provide novel coupling means between successive film units of the film pack.

Still another object of the invention is to provide the film pack with novel means for facilitating separation of exposed film units from the next-following unexposed film units.

An ancillary object of the invention is to provide a film pack wherein separation of preceding film units from the next-following film units necessitates the exertion of a small force.

Still another object of the invention is to provide a film pack wherein the parts which connect successive film units to each other cannot affect the quality of exposures, even under most unfavorable circumstances.



A further object of the invention is to provide a film pack wherein each preceding film unit is separated from the next-following film unit in an accurately determined region so that the next-following film unit is then in an optimum position for withdrawal from the container of the film pack upon completed exposure of its photosensitive sheet to scene light.

The improved film pack comprises a container having a passage, at least two film units stored in the container and each including a photosensitive sheet and a print-receiving sheet, a withdrawing device for withdrawing one of the film units along a predetermined path by way of the passage in the container upon completed exposure of photosensitive sheet in the one film unit to scene light, and a flexible coupling strip connecting the withdrawing device of the one film unit with one sheet of the other film unit so that the coupling strip emerges from the passage upon completed withdrawal of the one film unit and the other film unit can be withdrawn by the coupling strip along the aforementioned path upon completed exposure of its photosensitive sheet to scene light. The width of at least a portion of the coupling strip is preferably less than the width of a sheet. Each coupling strip may consist of synthetic plastic material whose thickness is preferably less than one-tenth of a millimeter.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved film pack itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal sectional view of a film pack which accommodates two film units and is constructed and assembled in accordance with a first embodiment of the invention;

FIG. 2 is a developed view of a coupling strip in a second film pack, additional coupling strips being shown in stacked condition;

FIG. 3 is a plan view of a leader and a masking sheet for use in the film pack;

FIG. 4 is a plan view of a further coupling strip; and

FIG. 5 is a plan view of still another coupling strip.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a container 1 which forms part of a film pack and consists of sheet metal or synthetic plastic material. This container may be a unitary one-piece structure or it may comprise several separable sections. One side wall of the container 1 is formed with a generally rectangular exposure aperture 1*a* and its front end wall has a passage 1*b* for withdrawal of successive film units.

A pressure plate 2 is provided in and divides the interior of the container into a first chamber which is adjacent to the exposure aperture 1*a* and a second chamber. The rear portion 2*a* of the pressure plate 2 (namely, that portion which is remote from the passage 1*b*) is rolled or curved to properly guide successive photosensitive sheets 5 which form a stack 3 in the first

chamber of the container 1. The second chamber accommodates a stack 4 of print-receiving sheets 9. Biasing means (not shown) are provided to urge the pressure plate 2 upwardly, as viewed in FIG. 1, so as to insure that the topmost photosensitive sheet 5 lies flat in the plane immediately adjacent to the exposure aperture 1*a*.

The leading (left-hand) end of each photosensitive sheet 5 is connected with the trailing end of a first flexible connecting strip 6 whose leading end is connected to the leading end 7 of a second flexible connecting strip 8. The latter has a trailing end which is connected to the leading (right-hand) end of the corresponding print-receiving sheet 9. The strips 6, 8 are of the same length and the length of each of these strips slightly exceeds half the length of a sheet 5 or 9. The leading end 7 of the strip 8 in the first film unit (including the outermost photosensitive sheet 5 and the outermost print-receiving sheet 9) is connected with a leader 13 which extends through the passage 1*b* and can be pulled to advance in the direction indicated by the arrow. In response to such pull, the leader 13 immediately draws the first connecting strip 6 and the outermost photosensitive sheet 5 around the rear portion 2*a* of the pressure plate 2 so that the outermost sheet 5 advances toward a position of registry or overlap with the outermost print-receiving sheet 9. The leading end 7 of the second connecting strip 8 shares the lengthwise movement of the ladder 13 and first connector strip 6; however, the strip 8 is merely bent over itself and causes the outermost sheet 9 to advance toward and through the passage 1b only when the outermost sheet 9 registers with the corresponding sheet 5. The two sheets 5, 9 are then caused to pass through the nip of two pressure applying rolls 10, 11 which are adjacent to but spaced from the passage 1*b* and are installed in the body of the camera. The strips 6, 8 together form a withdrawing device for the first film-unit including the two outermost sheets 5 and 9.

The first connecting strip 6 carries a rupturable receptacle or envelope 12 which contains a supply of processing fluid. This receptacle bursts open and its contents are distributed uniformly between the sheets 5, 9 during travel through the nip of the pressure applying rolls 10, 11.

In accordance with a feature of the present invention, the trailing (right-hand) end of the outermost photosensitive sheet 5 is connected with the leading end of an elongated coupling strip 14 which passes in the first chamber between the two photosensitive sheets 5, along the concave inner side of the first strip 6 for the outermost sheet 5 (i.e., along the convex side of the rear portion 2*a* of the pressure plate 2), between the two print-receiving sheets 9 in the second chamber, around the leading end of the inner sheet 9, and is connected with the leading end 7 of the second connecting strip 8 for the inner sheet 9. The coupling strip 14 is provided with a thickened portion or bead 15. When the user exerts a pull on the coupling strip 14 and causes the latter to pass through the nip of the rolls 10, 11, the bead 15 engages with these rolls and the user feels that the resistance to extraction of the strip 14 increases.

As shown in FIG. 2, the coupling strip 14 (shown in developed view, i.e., lying in a single plane) comprises an elongated portion 14′ whose width is constant and is only a fraction of the width of a sheet 5 or 9 and whose length equals or approximates twice the length of a sheet 5 or 9. The width of the next portion of the strip 14 increases gradually, as at 1b, to form a handgrip portion 16 whose trailing end is provided with the bead 15. The length of the handgrip portion 16 is such that it can be readily grasped by two fingers at the right-hand (downstream) side of rolls 10, 11 (FIG. 1) when the bead 15 enters the nip at the upstream (left-hand) side of these rolls. FIG. 2 further shows the leading end 7 of the next following second connecting strip 8 and the receptacle 12 which bursts open to distribute fluid between the sheet 9 which is connected to the just mentioned strip 8 and the corresponding sheet 5.

FIG. 2 also shows a preferred configuration of portions of coupling strips which precede the coupling strip 14. It is assumed that the strip 14 connects the next-to-the-last sheet 5 (shown in the lower part of FIG. 2) with the last film unit. The preceding coupling strips have pairs of symmetrical webs 14*a*, 14*b*, and 14*c* which flank the elongated portion 14′ of the strip 14. Such configuration of the coupling strips is desirable in order to avoid excessive localized thickening of the stack 3 in the first chamber of the container 1. The free ends of pairs of webs 14*a*, 14*b*, 14*c* are connected to each other by triangular tabs 14*d*. The elongated portion 14′ of the strip 14 is flanked by the webs 14*a*, 14*b*, 14*c* so that these parts together form a single staggered layer which does not cause localized thickening of the material in the first chamber of the container.

When a preceding film unit is being withdrawn from the container 1, the coupling strip 14 for the next-following film unit is not subjected to any tensional stresses, i.e., such coupling strip merely overcomes friction. Therefore, the strips 14 can be made of extremely thin material, preferably highly flexible synthetic plastic foil. Foils whose thickness is in the range of a few hundredths of a millimeter and which offer satisfactory resistance to tearing stresses arising in a film pack are known in the art. An advantage of extremely thin foils is that they can flex or bend over themselves with a very small radius of curvature. During the initial stage of withdrawal of a strip 14, such bending or rolling over takes place behind the exposure aperture 1*a*.

As shown in FIG. 2, the coupling strip 14 is weakened by a line of perforations 17 in the region between the elongated portion 14′ and the handgrip portion 16. These perforations reduce the resistance of the strip 14 to tearing stresses and enable the user to tear the strip with the exertion of a rather small force when the bead 15 enters the nip of the rolls 10, 11. If the sheets 5 are fixed in the first chamber of the container 1 by layers of relatively weak adhesive or the like, the weakened portion 17 of the coupling strip 14 should be strong enough to insure that the sheets 5 are set in motion in response to a pull on the handgrip portions 16.

FIG. 3 illustrates a leader 18 which extends from the passage 1*b* of a container 1 in a fresh film pack. The trailing end of the leader 18 is connected with an opaque masking sheet 19 which prevents penetration of light through the exposure aperture 1*a*. The leading end of the leader 18 is reinforced, as at 20, for example,

by a layer of adhesive-coated paper or the like. The length of the leader **18** is about twice or three times the length of a sheet **5** or **9**, and the thickness of its leading end **20** is such that it can be readily introduced through the nip of the rolls **10, 11**. These rolls are accessible upon removal or opening of the cover in a photographic camera for use with film packs. The masking sheet **19** is connected with the leader **13** shown in FIG. **1**.

When the container **1** is properly inserted into the camera and the user wishes to make a first exposure, he exerts a pull on the leading end **20** to draw the masking sheet **19** away from the exposure aperture **1***a* and to advance the leader **13** toward and through the nip of the rolls **10, 11**. The leader **13** comes to a halt when its bead **15** (FIG. **1**) reaches the nip of the rolls **10, 11**. The outermost sheet **5** is then ready for exposure and the leader **13** can be severed along a line of perforations corresponding to the perforations **17** shown in FIG. **2**. The handgrip portion **13***a* of the leader **13** remains accessible at the right-hand side of the rolls **10, 11**, as viewed in FIG. **1**. If desired, the leader **13** need not be formed with any perforations, i.e., the bead **15** thereon may merely serve as a signal that the user should tear the leader at a certain distance from the rolls **10, 11**.

When the first exposure is completed, the user exerts a strong pull on the portion **13***a* of the leader **13** so as to move the bead **15** through the nip of and beyond the rolls **10, 11**. The leader **13** then causes the freshly exposed outermost sheet **5** to move away from registry with the exposure aperture 1a and toward registry with the outermost sheet **9** in a manner as described above in connection with FIG. **1**. The leader **13** can thereby break a rather weak bond which fixes the outermost sheet **5** in registry with the aperture **1***a*. The sheets **5, 9** begin to move as a unit toward the rolls **10, 11** and the respective receptacle **12** is caused to burst open and to distribute its fluid contents in the space between the two sheets. The development of the exposed sheet begins.

As the user pulls the leader **13**, he causes the coupling strip **14** for the second film unit to advance toward and through the nip of the rolls **10, 11**. Such lengthwise movement of the strip **14** is terminated when its bead **15** engages the rolls **10, 11**. The strip **14** is thereupon broken along the perforations **17** so that only its handgrip portion **16** extends beyond the two rolls. The same procedure is repeated after the second exposure whereby the second coupling strip **14** advances through the nip of the rolls **10, 11** and tears to leave a short handgrip portion **16** which is pulled upon completion of the third exposure, and so forth. Faulty manipulation is extremely unlikely because all the user has to know is to pull upon the exposed handgrip portion **13***a* or **16** upon completion of an exposure until the leader **13** or a coupling strip tears.

If desired, the sheets of each film unit in the container **1** can be stacked in such a way that each sheet **9** is caused to roll over itself during withdrawal by way of the passage **1***b*. Furthermore, the leaders **13, 19** and the coupling strips **14** may consist of paper, metallic foil or a combination of paper with metallic or plastic foil. It is equally possible to secure each coupling strip **14** to the trailing end of the corresponding picture-receiving sheet **9**.

Referring again to FIG. **1**, the leader **13** is closely analogous to and constitutes a coupling strip **14** if the container accommodates three or more film units. Thus, if the film units shown in FIG. **1** are the last two of three or more units, the leader **13** represents that part of a coupling strip **14** which served to connect the freshly withdrawn film unit (not shown) with the film unit including the two outermost sheets **5, 9** of FIG. **1**. Thus, the portion **13***a* then corresponds to the handgrip portion **16** of FIG. **2**.

FIG. **4** illustrates a coupling strip **114** which is similar to the strip **14** of FIG. **2** with the sole exception that the bead **115** is relatively short and makes an acute angle with the longitudinal direction of the strip. Such inclination of the bead **115** facilitates tearing of the strip **114** along the line of perforations **117** when the bead **115** reaches the nip of the pressure applying rolls (not shown in FIG. **4**). Since the bead **115** is inclined, the stresses along one edge of the elongated portion **114'** increase when the operator exerts a pull in the direction indicated by arrow so that the tearing of strip **114** begins along the perforations **117** in a direction from the left to the right, as viewed in FIG. **4**. As a matter of fact, the entire strip **114** can be caused to change its position when the bead **115** enters the nip of the pressure applying rolls. If desired, the inclined bead **115** can extend across the entire strip **114**. Also, the bead could be placed into a central zone of the strip **114**.

In order to avoid undue thickening of the stack in the first chamber of the container, the beads **115** of successive coupling strips **114** can be located at the opposite sides of the common central symmetry plane of such strips. The position of the bead **115***a* on the next-following strip **114** is indicated in FIG. **4** by phantom lines.

Due to one-sided or eccentric location of the bead **115**, the left-hand edge portion of the strip **114** first undergoes elastic deformation when the bead **115** enters the nip of the pressure applying rolls, and the tension in the left-hand edge portion then increases to cause tearing of the strip **114** between the left-hand edge and the leftmost perforation **117**. The stress is thereupon concentrated on the web between the two leftmost perforations **117** until this web yields and tears, and the same procedure is repeated until the strip **114** is caused to tear all the way to its right-hand edge portion.

The fact that the bead **115** is inclined does not affect withdrawal of the next film unit because the user can grip the relatively wide handgrip portion **116** and can cause the bead **115** to pass between and beyond the pressure applying rolls. Moreover, the distance between the line of perforations **117** and the bead **115** is rather short. Thus, the handgrip portion **116** is quite capable of withstanding the stresses which arise when the inclined bead **115** must be caused to advance beyond the pressure applying rolls. If desired, the bead **115** can consist of a line of discrete protuberances.

The coupling strip **114** of FIG. **4** represents a simple solution of the problem of insuring that successive film units of a film pack are separated from each other in predetermined zones and in such a way that the next-following unit can be readily withdrawn as soon as its photosensitive sheet is exposed to scene light. Another important advantage of the coupling strip **114** is that its weakened portion **117** can be destroyed by exertion of

a relatively small force as well as that this weakened portion can readily withstand tensional stresses which arise during withdrawal of the preceding film unit while the bead **115** travels toward the pressure applying rolls. It is preferred to select the position of the bead **115** in such a way that its distance from the center of the strip **114** (i.e., from the longitudinal central symmetry plane of the strip) at least equals half the width of the weakened portion **117**.

Referring finally to FIG. **5**, there is shown in developed view a further coupling strip **214** which connects a preceding film unit with the handgrip portion of the next-following coupling strip. The strip **214** comprises a bifurcated portion including two arms **221, 222** which straddle the photosensitive sheet **5** of the next-following film unit. The arms **221, 222** are then adjacent to the emulsion-coated side of the sheet **5**.

It is well known that decomposition of highly sensitive silver salt particles in the emulsion of the sheet **5** can take place in response to exposure to light as well as on exposure to the action of several chemical substances, such as certain softening agents in plastic foils, certain solvents for lacquers and the like. This causes blackening of localized areas of the sheet **5**. In order to avoid the likelihood of affecting the quality of exposures even when a film pack is stored under most unfavorable circumstances, the arms **221, 222** of the strip **214** are placed close to those portions (**5A, 5B**) of the sheet **5** which are not exposed to scene light, i.e., which do not carry a portion of the image because they are overlapped by the marginal masking portions of the corresponding image-receiving sheet **9**. Thus, even if the material of the arms **221, 222** contains an agent which could affect the quality of exposures, such agent acts on the emulsion of the sheet **5** in regions **5A, 5B** which are thereupon overlapped by the masking portions of the associated sheet **9**.

The arms **221, 222** extend from a triangular intermediate portion **223** of the coupling strip **214**. The portion **223** has a concave edge face **223***a* which overlies the adjoining portion **5D** of the sheet **5** when the strip **214** is properly folded in the first chamber of a container in a film pack. Such configuration facilitates flexing of the strip **214** in the region of the portion **223** during withdrawal from the container.

An advantage of the strip **214** is that the manufacturer can pick its material from a wider selection of materials including those which might contain certain chemicals that could, under adverse circumstances, affect the emulsions on the adjoining photosensitive sheets S. The numberal **217** denotes the weakened portion of the coupling strip **214**.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

**1**. In a photographic film pack, a combination comprising a container having a passage; identical first and second film units stored in said container and each including a photosensitive sheet and a print-receiving sheet, the photosensitive sheets of said units being stored separately from said print-receiving sheets of said units; identical first and second withdrawing means for respectively withdrawing said first and second film units along a predetermined path by way of said passage, each of said withdrawing means comprising a pair of connecting strips each having a trailing end connected to the leading end of a different sheet of the respective film unit and a leading end connected to the leading end of the other connecting strip, the leading end of at least one connecting strip of said first withdrawing means being accessible for the application of a withdrawing force outside of said passage; and a flexible coupling strip connecting the trailing end of one sheet of said first film unit with the leading ends of connecting strips of said second withdrawing means so that said coupling strip emerges from said passage upon withdrawal of said first film unit and can be advanced along said path to effect the withdrawal of said second film unit, the connecting strips of each of said withdrawing means being connected to each other in such a way that one sheet of the respective film unit is advanced toward said passage ahead of the other sheet in response to a pull upon said accessible leading end to withdraw said first film unit and in response to a pull upon said coupling strip to withdraw said second film unit and that, during removal from said container by way of said passage, the sheets of the respective film units overlap each other.

**2**. A combination as defined in claim **1** wherein, prior to withdrawal from said container, said print-receiving sheets and said photosensitive sheets respectively form discrete first and second stacks.

**3**. A combination as defined in claim **1**, wherein first and second portions of said coupling strip respectively extend between the photosensitive sheets and the print-receiving sheets of said first and second film units prior to withdrawal of said first film unit from said container.

**4**. A combination as defined in claim **1**, wherein a portion of said coupling strip is disposed between a connecting strip of said first withdrawing means and a connecting strip of said second withdrawing means prior to withdrawal of said first film unit from said container.

**5**. A combination as defined in claim **1**, wherein said coupling strip comprises portions of different width.

**6**. A combination as defined in claim **1**, wherein said coupling strip comprises portions of different thickness.

**7**. A combination as defined in claim **1**, wherein the connecting strips of each of said withdrawings means are of identical length.

**8**. A combination as defined in claim **1**, wherein the sheets of said second film unit are disposed between the sheets of said first film unit prior to withdrawal of said first film unit.

**9**. A combination as defined in claim **1**, wherein the leading end of one sheet of each film unit is more distant from said passage than the leading end of the other sheet prior to withdrawal of the respective film unit.

**10**. A combination as defined in claim **1**, further comprising a pressure plate disposed in said container between said photosensitive and said print-receiving sheets, said pressure plate having a guide portion remote from said passage and said one sheet of each of

said film units is caused to travel along said portion of said pressure plate while advancing toward said passage.

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