

[54] **FILM SPLICING APPARATUS**

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[22] Filed: **Apr. 10, 1973**

[21] Appl. No.: **349,761**

[30] **Foreign Application Priority Data**

Apr. 13, 1972 Japan..... 47-43835

[52] U.S. Cl..... **156/461, 156/157, 156/164,**
156/202, 156/494, 156/505, 156/545

[51] Int. Cl..... **B31f 1/00**

[58] Field of Search 156/54, 191, 202, 216,
156/304, 443, 456, 505, 506, 555, 502, 162,
163, 164, 204, 226, 227, 459, 461, 479, 494,
157, 545

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[57]

ABSTRACT

A device for splicing photographic films together, especially suited for splicing together a number of films together to facilitate their passage through developing and fixing solutions. Each splice is formed with an adhesive tape which has a length longer than the width of the films so that the tape extends beyond each longitudinal edge of the films. The apparatus includes a roller having a pair of spaced flanges, one at each end thereof, the two flanges defining therebetween a groove of a width corresponding to the sum of the film width plus twice the thickness of the adhesive tape. The ends of each splicing tape are folded onto the opposite side of the film as the film passes around the flanged roller. A pair of pressing rollers are also provided to apply pressure to both sides of the splice to secure the folded end portions of the splicing tape.

4 Claims, 7 Drawing Figures

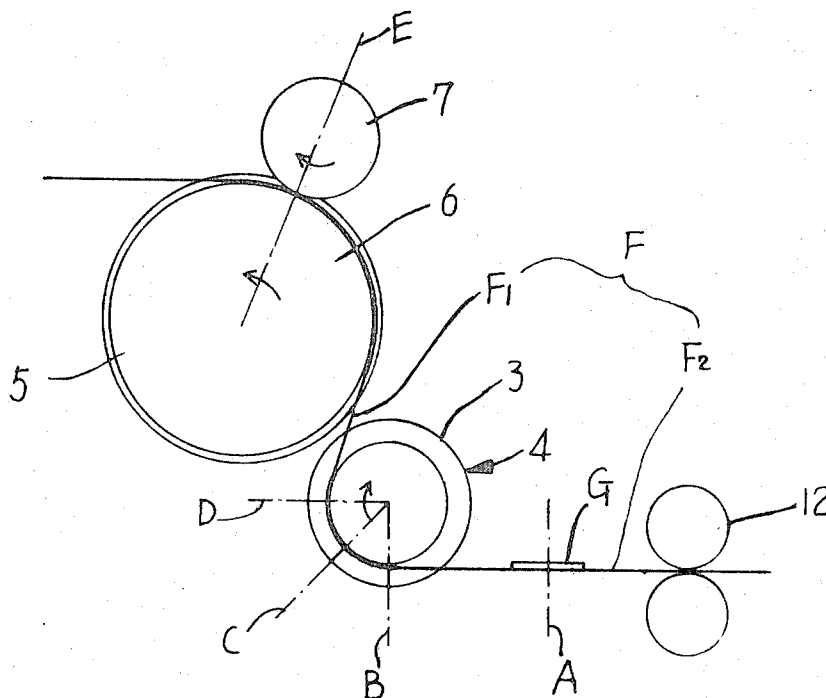


FIG. 1

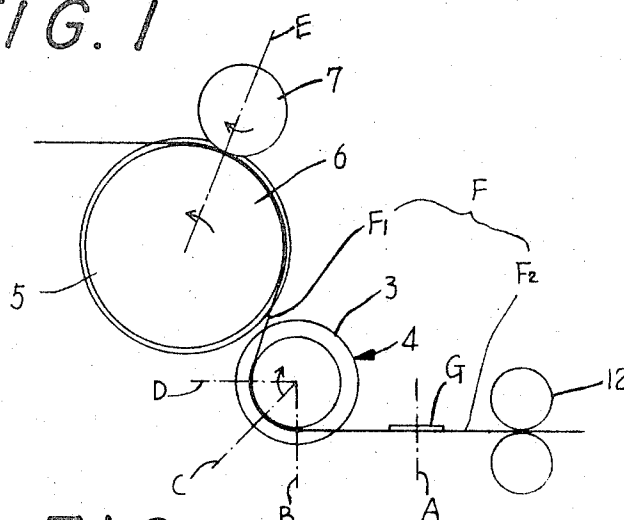


FIG. 2

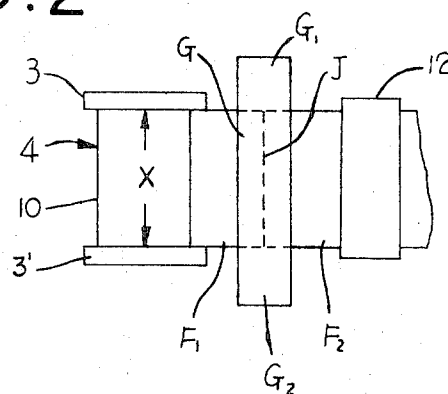


FIG.3a. FIG.3b. FIG.3c. FIG.3d. FIG.3e.

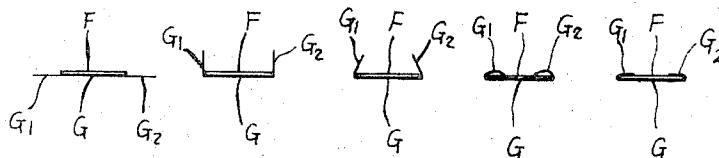


FIG. 4

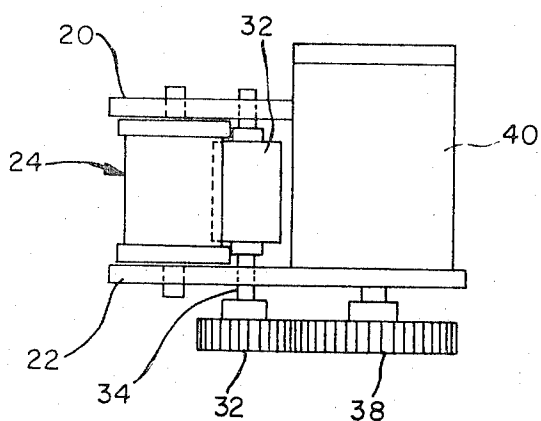


FIG. 5

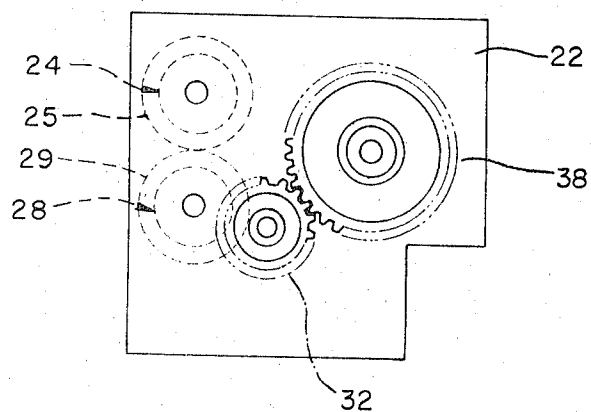


FIG. 6

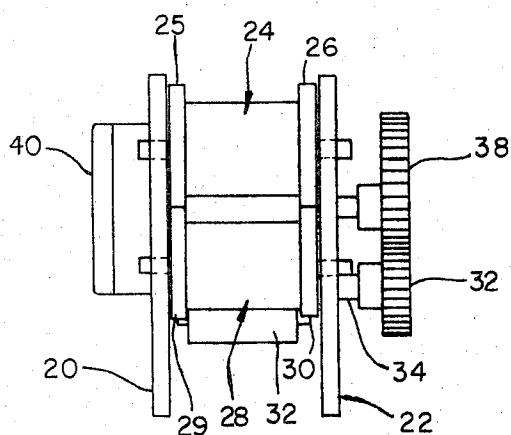
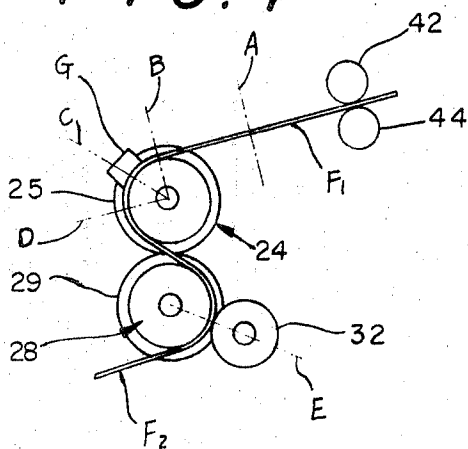


FIG. 7



FILM SPLICING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to a device for splicing together film sections by which projecting end portions of a splicing tape are folded over and secured to the opposite side of the splice.

In developing, fixing and water-washing photographic films, it is conventional practice to connect the films end to end by adhesive connecting tapes which have lengths corresponding to, or smaller than, the width of the films. However, when the films spliced in this manner are passed through the various processing liquids, particularly where bent in passing around rollers, and more particularly where the center of bending faces the side on which the connecting tape is adhered, the processing liquids tend to penetrate into the interspace between the films and the connecting tape entering at the gap between the butted ends of the films on the side opposite the connecting tape. This penetration causes the connecting tapes to peel off and results in separation of the film sections which, in turn, necessitates interruptions in the various processing operations.

In order to avoid the problems described above, a number of devices have been designed which join a plurality of elongated photographic films together by applying an adhesive strip to one side of the butted ends of the films, which adhesive tape has a length longer than the width of the films. These devices operate to fold the overlapping end portions of the connecting tape, which project outwardly beyond the longitudinal edges of the film, onto the opposite side of the film. However, such splicing devices are usually complicated in construction, difficult to handle, low in efficiency and involve high production costs.

SUMMARY OF THE INVENTION

The present invention provides a device for folding and fixing projecting end portions of an adhesive splicing tape onto the side of the film opposite that to which the tape is initially applied. The apparatus includes a roller having a pair of spaced flanges, one at each end thereof, the two flanges defining therebetween a flat-bottom groove of a width corresponding to that of the film plus twice the thickness of the splicing tape. The ends of each splicing tape are folded onto the opposite side of the film as the film passes around the flanged roller. A pair of pressing rollers are also provided to apply pressure to both sides of the splice to secure the folded end portions of the splicing tape.

Accordingly, it is an object of the present invention to provide an improved device for folding and affixing projecting end portions of an adhesive splicing tape which is applied to one side of the abutted ends of elongated photographic films.

It is a further object of the present invention to provide such a device that is simple in construction, easy to handle, high in efficiency, and low in manufacturing costs, as compared with the conventional counterparts.

It is yet another object to provide such a device that can easily be used in combination with various existing film transport means for uninterruptedly feeding a number of elongated photographic films in a continuously connected form.

It is a still further object of the present invention to provide such a device that will make adhesive tape splices for photographic film which splices are capable of maintaining their integrity upon being passed through various film treatment chemical solutions.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description to follow, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation showing apparatus of the present invention with a film passing therethrough; one flange of each roller is cut away to show the film position;

FIG. 2 is a plan view of a portion of the apparatus and film shown in FIG. 1, further showing an adhesive splicing tape;

FIGS. 3a, 3b, 3c, 3d and 3e are end views of a film with an adhering splicing tape as it appears at successive points during passage through the apparatus of the present invention;

FIG. 4 is a plan view showing the main components of another embodiment of the present invention;

FIG. 5 is a front elevational view of the apparatus shown in FIG. 4;

FIG. 6 is an end view of the apparatus shown in FIG. 4; and,

FIG. 7 is a front elevational view, in cross-section of the embodiment of FIGS. 4, 5 and 6, showing a film and further showing the disposition of an overlapping end section of a splicing tape as it starts around a folding roller.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2, F designates a length of connected photographic films including films F1 and F2. Films F1 and F2 are connected at J by means of a splicing tape G which has an adhesive surface pressed against one side of the abutting ends of films F1 and F2. The adhesive connecting tape G has a length longer than the width of the photographic films F1 and F2 which length leaves end portions G1 and G2 projecting outwardly beyond the longitudinal edges of the films. A flanged roller, or folding roller, 4 is provided for folding the projecting end portions G1 and G2 onto the opposite side of the splice J. The flanged roller 4 carries a pair of spaced flanges 3, 3' which are formed around the circumference of the roller and define a flat winding surface or groove 10, therebetween. The flat groove 10 has a width substantially corresponding to the sum of the width of the film F plus double the thickness of the adhesive connecting tape G. Reference numerals 6 and 7 designate a pair of pressing rollers one of which is rotatably mounted in a fixed position while the other roller is an idling roller made of a resilient material, such as of rubber, which is biased against the fixed roller. The arrows in FIG. 1 indicate the direction of the rotational movement of the various rollers. Reference characters A, B, C, D, and E indicate, stepwise, the formation of the splice at J as J passes through the apparatus of the present invention. The take-up reel which draws the film F in the direction of travel indicated by the arrow and the apparatus for applying the splicing tapes to one side of the junction J of films F1 and F2

are conventional and have been deleted from the drawings for simplicity of illustration.

The distance X, in FIG. 2, approximately corresponds to the width of the film being processed plus twice the thickness of the adhesive splicing tape.

The leading end of film F1 is drawn in the direction indicated by the arrows by means of a take-up reel to which it is connected by means of the preceeding film strip or by a leader. When the trailing end of the photographic film F1 arrives at the point or station where the adhesive connecting tape G is applied, the leading end of the succeeding photographic film F2 is abutted against it. The adhesive surface of the connecting tape G is then pressed against the upper surface of film F at the point where films F1 and F2 are abutted together. Connecting tape G has been cut to a length longer than the width of the photographic films prior to application, so that end portions G1 and G2 project outwardly beyond the longitudinal edges of the films at position A of FIG. 1 in the manner shown in FIG. 2 and FIG. 3a. A slight tension is imparted to the film strip F by means of the snubbing rollers 12. When the spliced junction J of films F1 and F2 reaches position B of FIG. 1, the outwardly projecting end portions G1 and G2 of the connecting tape are passed through the confined space defined by the flanges and are folded inwardly by the flanges 3, 3' of the flanged roller 4 and into a position approximately perpendicular to the film F as shown in FIG. 3b. As joint J passes point B and travels further around roller 4, tapes G1 and G2 fold closer together, or inwardly, due to a combination of factors, including: the curvature of the winding surface 10, the tension in the film F, and the force of inner surfaces of flanges 3 and 3' due to the limiting width of surface 10. Upon advancing to position C of FIG. 1, the outwardly projecting end portions G1 and G2 are folded further inwardly as shown in FIG. 3c and then further inwardly at D as shown in FIG. 3d. Finally, the folded end portions G1 and G2 are pressed to adfix them to the film surface at E of FIG. 1 where they enter the "pinch" between rollers 5 and 7, giving the final configuration shown in FIG. 3e.

FIGS. 4, 5, 6 and 7 show another embodiment of the present invention. FIG. 7 shows the manner in which the curvature of the folding roller forces the splicing tape ends inwardly. In this embodiment, a pair of parallel supporting frames, 20 and 22, rotatably support a flanged folding roller 24 and a pair of pressing rollers 28 and 32. The flanges 25 and 26 of the flanged roller 24 are intermeshed, or frictionally engaged with flanges 29 and 30, respectively, of pressing roller 28. In this manner, the rotation of pressing roller 28 serves to drive folding roller 24. Pressing roller 32 is rotatably supported on a shaft 34 which is, in turn, supported in frame members 20 and 22 and which is mounted so that the surface of roller 32 presses against the surface of roller 28. The shaft 34 has secured at one end thereof a gear 36 which meshes with a drive gear 38 which, in turn, is connected to the drive shaft of a motor 40 through a reducer or the like. A pair of snubbing rollers 42 and 44 serve to impart the requisite tension to the film.

It should be clear from the foregoing description that the present invention operates to fold the sidewardly

projecting end portions of the adhesive connecting tape inwardly simply by bending the film around the winding surface of a flanged roller, which winding surface is of a width substantially corresponding to the width of the film plus double the width of the splicing tape, and passing the splice therethrough.

It will be appreciated that the apparatus of the present invention may be combined with a suitable film transport means and used in developing, fixing and water-washing treatments for film.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

We claim:

1. Apparatus for splicing two abutting sections of flexible material with a piece of tape adhered to and extending across said sections with each end of tape protruding from the longitudinal edges of said flexible material, said apparatus comprising a spool member having a pair of flanges defining a flat-bottom groove and being spaced apart a distance approximately corresponding to the sum of the width of the film being processed plus twice the thickness of the adhesive splicing tape, means for passing said flexible material with said tape adhered to the abutting end portions thereof over said spool in a manner to cause said protruding ends of said tape to be initially forced by said flanges into a position extending at right angles to said film, and then inwardly together by said spool as the abutting ends pass around said spool.

2. The apparatus of claim 1 additionally comprising a pair of rollers biased together which operate to press the folded ends of said splicing tape against a surface of said film.

3. The apparatus of claim 1 further comprising film transport means for transferring photographic films in continuous fashion through at least one liquid bath.

4. Apparatus for splicing photographic film by means of applying a tape section having an adhesive surface, which tape is adhered to the film at a joint formed by abutting the ends of two film sections together, the tape section being of a length longer than the width of the photographic film so that each end of the tape protrudes beyond a longitudinal edge of the film, said apparatus comprising:

means to impart tension to film, and a spool member having a pair of spaced flanges, said flanges defining a flat-bottom groove and being spaced apart a distance corresponding to the sum of the width of the film being processed plus twice the thickness of the adhesive splicing tape so that the tension in the film causes the ends of the splicing tape protruding beyond the longitudinal edges of the film to be forced into a position at right angles to said film and inwardly together as the film joint passes around said spool.

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