# United States Patent [19]

**Nishimoto**

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[54] **AUTOMATIC ADHESIVE TAPE FEEDING DEVICE**


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[52] **U.S. Cl.** ..... **156/505**; 156/304; 156/443

[51] **Int. Cl.** ..... **B31f 5/00**; G03d 15/04

[58] **Field of Search** ..... 156/304, 443, 502, 505, 156/506, 538, 545, 555; 226/88, 193



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[57] **ABSTRACT**

The present invention relates to an improvement in an automatic adhesive tape feeding device for a photographic film splicing apparatus for bringing the tail end of one film into alignment with the lead end of another prior to or after development.

The device includes an adhesive tape drawing means having, in combination, a first rotatable roller and a second or draw-out roller resiliently contacting the former and provided, on its circumferential surface facing the adhesive side of the tape, with a plurality of saw-teeth made of an adhesion-resistant material such as TEFLON; and an adhesive tape feeding means having, in combination, a pair of feed rolls of which one roll has a conical-convex circumferential surface and the other roll has a conical-concave circumferential surface lined with a non-adhesive material such as TEFLON. The feed rolls are characterized in that they serve to feed an adhesive splicing tape from its supply roll to a film connecting position without sticking to either feed roll and in that the tip of the tape is formed into a V-shaped configuration to prevent the tape from hanging down after it passes through the feeding means.


**4 Claims, 7 Drawing Figures**

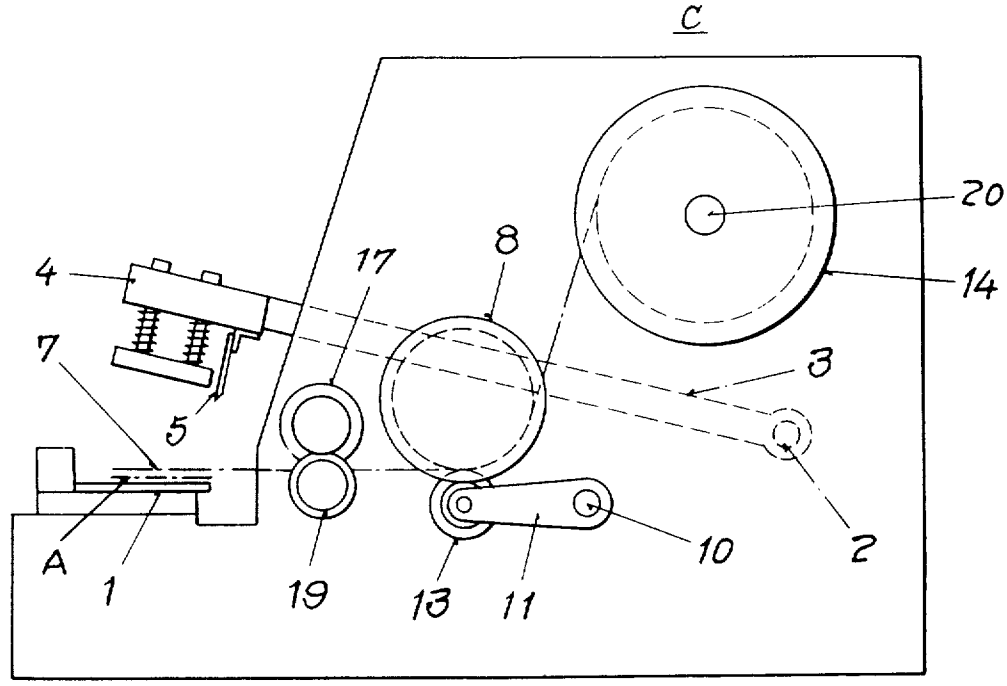


Fig. 1

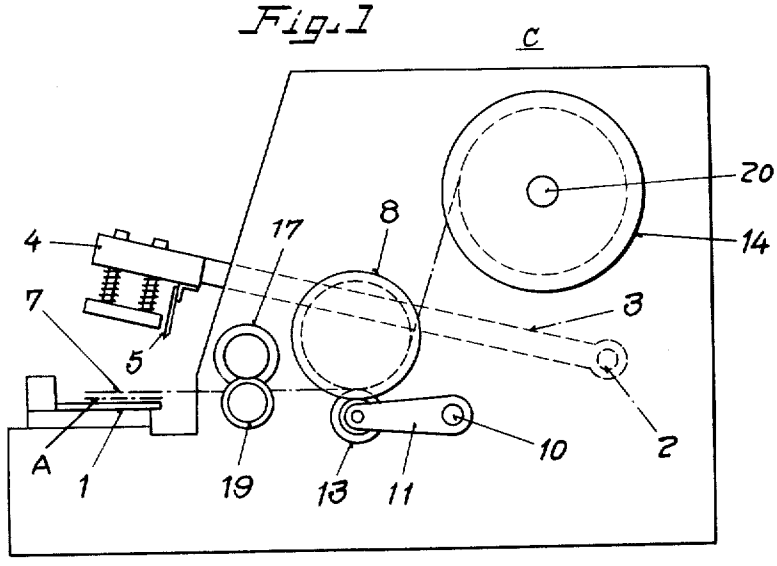



Fig. 3

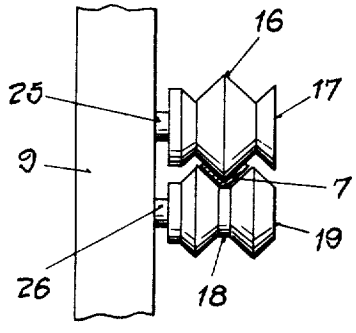



Fig. 2

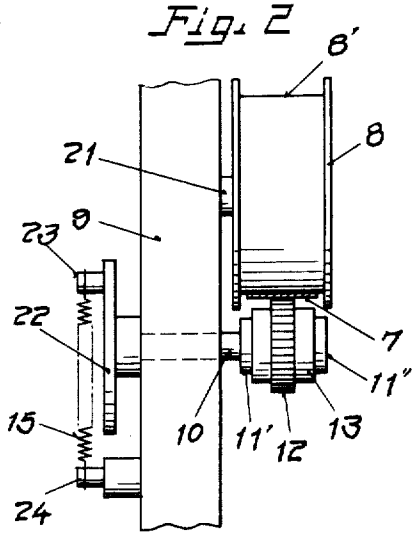


Fig. 4

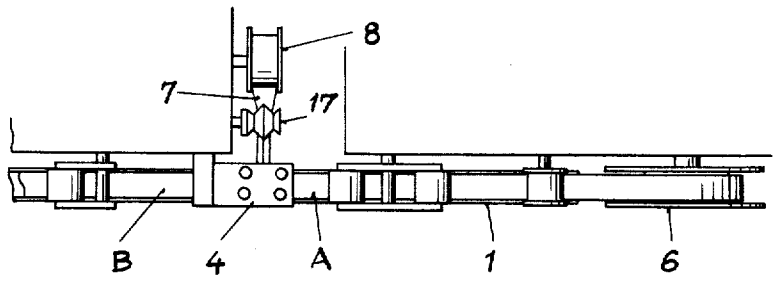



Fig. 5

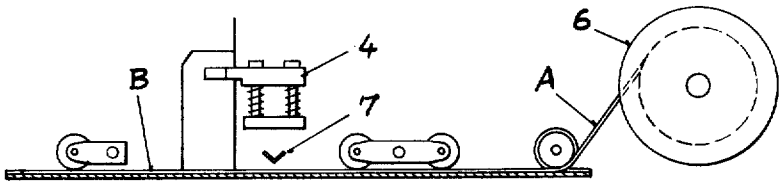
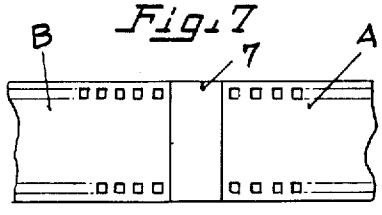



Fig. 6




Fig. 7



# AUTOMATIC ADHESIVE TAPE FEEDING DEVICE

## BACKGROUND OF THE INVENTION

The present invention relates to an improvement in an automatic adhesive tape feeding device for a photographic film connecting machine for bringing the tail end of one film into alignment with the lead end of another prior to or after development.

In connection with automatic photographic film connecting machines of this type it has been desired to provide a device to feed a film connecting adhesive tape efficiently and straightly to a desired position, that is, the position at which the film ends are aligned and abutted.

To solve this problem, various methods and devices have been proposed and some of them have actually been reduced to practice but they are generally unsatisfactory and further improvements are strongly needed in the field.

Accordingly, an object of the present invention is to provide an adhesive tape feeding device for a photographic film splicing apparatus for feeding the splicing tape smoothly and straightly to a position where the tail end of one film and the tip of another are aligned and connected.

Another object of the present invention is to provide an adhesive tape feeding device for a photographic long film splicing apparatus characterized in the provision of an adhesive tape feeding means having, in combination, a first rotatable roller capable of being rotated or stopped relative to the movement of a film to be connected and a draw-out roller resiliently contacting the first roller and provided, on its circumferential surface facing the adhesive side of the tape, with a plurality of saw-teeth made of an adhesion-resistant material such as TEFLON thereby preventing the tape from sticking.

Still another object of the present invention is to provide an adhesive tape feeding device for a photographic film splicing device characterized by a pair of feed rolls of which one roll has a conical-convex circumferential surface and the other roll has a conical-concave circumferential surface lined with a non-adhesive material such as TEFLON thereby providing means for feeding the tape to a film connecting position efficiently and horizontally without the tape adhering to either of the rolls and without the tip of the tape hanging down.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a photographic film splicing apparatus according to the present invention;

FIG. 2 is a front view of the draw-out roll of the adhesive tape feeding device of the apparatus shown in FIG. 1;

FIG. 3 is a front view of the pair of adhesive tape feed rolls of the apparatus shown in FIG. 1;

FIG. 4 is a plan view of the film connecting portion of the device shown in FIG. 1;

FIG. 5 is a front view of the film connecting portion shown in FIG. 4;

FIG. 6 is a front view showing a completed connection or splice of two films; and

FIG. 7 is a side view of the splice shown in FIG. 6.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1, 2, and 3, one embodiment of the film splicing apparatus of the present invention, generally designated C, is shown as including a film guide rail 1 along which a first film A procedes a second film B (not shown), a tape suppressor 4 with a cutter 5, an adhesive tape roll 14 wound with an adhesive tape 7 and rotatably mounted on shaft 20, a roll 8 rotatably mounted on a shaft 21, an adhesive tape draw-out roll 13 mounted on an arm 11 pivotally supported by a shaft 10 and an adhesive tape feed rolls 17 and 19 rotatably mounted on shafts 25 and 26, all of the shafts being supported by the machine frame 9.

With such an arrangement, the adhesive tape 7 which has been transferred to and passed around the roll 8 is sandwiched between the circumferential surface 8' of the guide roll 8 and the draw-out roll 13 with the adhesive side of the tape facing the latter. The roll 8 is capable of being rotated or stopped relative to the movement of the film on the guide rail 1. The guide rail 1, with the exception of the film connecting portion thereof, is of a trough-like configuration with banks on both sides and extends in a direction perpendicular to the adhesive tape feeding direction. The draw-out roll 13 is rotationally supported between forked end portions 11' and 11'' of an arm 11 mounted on one end of the shaft 10 running through the machine frame 9. The tape 7 passes from the draw-out roll 13 into the clearance between the feed rolls 17 and 19 and is then transferred to a position on guide 1 where films A and B are connected. Thus, when the tip of the adhesive tape 7 reaches a position above the abutted end portions of the films, the suppressor 4, which is mounted on a lever 3 pivotable at a pin 2, is actuated to apply force upon the upper surface of the tape 7 and, at the same time, the cutter 5 shears the tape 7 to a length equal to the width of the film, thus forming a tight splice of films A and B.

Referring to FIG. 2, the draw-out roll 13 is shown, as previously mentioned, rotatably supported between the forked end portions 11' and 11'' of the arm 11 which is supported by one end of the shaft 10 running through the machine frame 9. The outer circumferential surface of the roll 13 is provided with a plurality of saw-teeth 12 which are formed of a non-sticking material such as TEFLON and are resiliently in contact with the circumferential surface 8' of the guide roll 8, allowing, however, the adhesive tape 7 to be passed therebetween. The other end of the shaft 10 runs through and extends beyond the rear wall of the machine frame 9 to support a disk 22. The disk 22 is provided with a protrusion 23 at the upper portion of the surface of the disk 22 away from the rear wall of the machine frame 9. The protrusion 23 is biased toward an arm membrane 24 by means of an eccentric coil spring 15 which is stretched between the protrusion 23 and the side arm 24 which is located at a lower portion of the rear wall of the machine frame 9. Thus, when the tape 7 is introduced between the circumferential surface 8' of the roll 8 and the draw-out roll 13, with its adhesive side facing downwardly, the tape is smoothly drawn off the supply roll 14 by the saw-teeth 12 by the rotation of the roll 13. As is apparent, each tooth 12 has only a small contact area with the tape 7 and the tape is drawn out in a clutch like manner. Because the saw-teeth 12 are made of a non-adhesive material such as Teflon there is no fear of the tape sticking to, and being rolled around, the draw-out roll 13.

Referring to FIG. 3 which shows an enlarged side view of the feed rolls 17 and 19 shown in FIG. 1, the feed rolls 17 and 19 are capable of rotated or stopped relative to the movement of the film on the guide rail 1 and are mounted on shafts 25 and 26 respectively supported by the machine frame 9. The circumferential surface 16 of the roll 17 is of conical-convex configuration and the circumferential surface 18 of the roll 19 is of frustoconical, concave configuration so that both rolls 17 and 19 may be mated with each other leaving a small clearance therebetween for allowing the tape 7 to pass through. Further, since the circumferential surface 18 of the roll 19 faces the adhesive side of the tape 7 it is preferable to have the surface 16 made of a non-sticking material such as TEFLON to prevent the tape from sticking thereto. The tape 7, which has been drawn off the draw-out roll 13, is then inserted automatically into the clearance between the circumferential surfaces 16 and 18 of rolls 17 and 19 respectively and, as it advances, is bent V-shaped due to the configuration of the surfaces 16 and 18 so that the non-adhesive side (upper surface) of the tape 7 is bent V-shaped along the surface 16 and the adhesive side of the tape 7 contacts the surface 18 only along its hypothetical longitudinal central line, resulting in the tape having only a small contact surface with the surface 18, as in the case of the draw-out roll 13. Optionally, the surface 18 of the roll 19 may be provided with a plurality of saw teeth, like those of the draw-out roll 13, for further preventing the tape 7 from sticking thereto.

Referring to FIGS. 4, 5, 6 and 7, the tail end of the preceding film A and the tip of the succeeding film B are aligned with each other within the horizontally extending film guide rail 1 which has banks on both sides for guiding the movement of both films, in cooperation with a suitable number of upper guide rolls. After passing the splicing apparatus the film is taken up around a reel 6. The roll 8, the draw-out roll 13 (not shown), the feed rolls 17 and 19 (not shown) and the tape suppressor 4 are all aligned normal to the film guide rail 1 so that the tip of the tape 7 may be placed in line with the line between the abutted film ends. Further, as it is apparent from the foregoing explanation, the tip of the tape 7 placed in position above the connection line of the films A and B is bent V-shaped as shown in FIG. 5 and is thereby prevented from bending downwardly due to gravity, and a tight splice between the films can be obtained when the tape is forced downwardly by the suppressor 4. The tape thus applied on the film connection line is cut by the cutter 5 attached to the suppressor 4.

As described above, the device according to the present invention offers the advantage of a draw-out roll which is provided with a plurality of saw teeth made of an adhesion resistant material which enable the tape to be drawn out smoothly from the tape roll without sticking to the draw-out roll. It is a further advantage in that the pair of feed rolls are of concave-convex configuration respectively, which configuration bends the tape into a V-shaped form when passing therethrough so that the tip of the extremely thin tape can move forward horizontally, without hanging down.

Thus, although the present invention has been described only with respect to its preferred embodiment it should be noted that various changes or alterations can be made without departing from the spirit and scope of the present invention and all these are to be included in the scope of the present invention.

What is claimed is:

1. An apparatus for splicing two sections of flexible material comprising:

means for aligning and abutting an end of a first section with an end of a second section;

means for feeding a length of adhesive splicing tape to a position adjacent said ends, said feeding means comprising means for bending the tape along a longitudinal axis of the tape into a V-shaped configuration, said bending means comprising first and second roller members engaging said tape, said first roller member having a frustoconical-concave circumferential surface and said second roller member having a conical-convex circumferential surface, the circumferential surface of said first roller member being intermeshed with the circumferential surface of said second roller member to provide for contact between the splicing tape and said frustoconical-concave circumferential surface only along a central line of said frustoconical-concave surface; and

means for flattening and pressing said tape into intimate contact with said ends.

2. The splicing apparatus of claim 1 wherein said feeding means further comprises a third roller member having a circumferential surface engaging said tape, said circumferential surface of said third roller having a plurality of teeth-like projections.

3. The apparatus of claim 2 further comprising a fourth roller member engaging the surface of said tape opposite the surface engaged by said third roller member.

4. The apparatus of claim 3 further comprising resilient means for biasing said third and fourth rollers together towards said tape.

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