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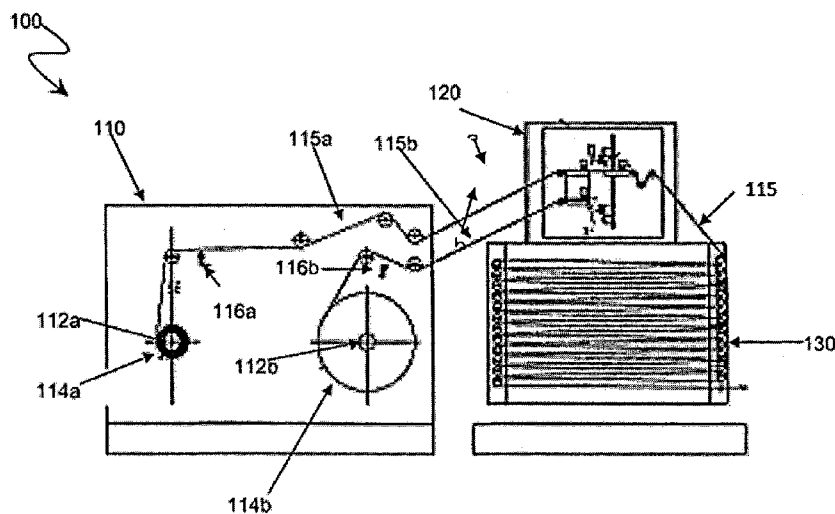


FIGURE 1

(57) Abstract: A system for automatic web splicing, comprises of an unwinding section, a splicing section, an accumulator, and a controller to facilitate clamping, cutting and splicing of the webs to provide continuous web supply to a utilizing machine. The system joins the two webs in completely auto mode and keeps the utilizing machine running continuously without stoppage.

**Title.: AUTOMATIC SPLICING SYSTEM AND METHOD THEREOF****FIELD OF THE INVENTION:**

The present invention generally relates to a splicing system for providing continuous web supply and a method thereof.

**5 BACKGROUND OF THE INVENTION:**

Continuous flow of web is required in paper and plastic laminate manufacturing process and preferably for printing. Accordingly, leading edge of a new roll of web is spliced with the trailing edge of an old web.

Traditionally, splicing of webs is achieved by manually/automatically joining the  
10 trailing edge of the old web with leading edge of a new web from webs being unwound from rolls carried on cores. The splicing is done by applying adhesive over trailing end or leading end and joining by overlapping the web or by using an adhesive tape to join the two ends with overlap or butt splicing.

To carry out such splicing manually, either subsequent machine is stopped or  
15 requires slowing down of the subsequent machine and use of an accumulator considering the time required to splice the webs. Moreover, in web-printing, precision plays important role in splicing as incorrect splicing may lead to improper printing registration resulting in rejections. Furthermore, the overlapping splicing method has a serious disadvantage since the thickness of the web increases at the  
20 overlapped portion, the variation in thickness effects coating or printing results when the web is fed through a coating or printing machine.

US Patent 6,016,989 granted in the year 2000 discloses a 'Paper Web Autosplicer' to produce a double-sided web splice for paper webs. However, in this patent the

leading and trailing edges are required to be settled downwardly under their own weight onto the adhesive face of the tape and hence splicing accuracy depends upon the weight of the web.

Therefore, there is a need for an automatic splicing system and method to resolve  
5 above issues.

#### SUMMARY OF THE INVENTION:

Accordingly, the present invention provides in a first aspect a system for automatic web splicing adapted on a running path of a web between an unwinding section and a utilizing machine for providing continuous flow of web to the utilizing machine. The  
10 said system comprises at least two receiving platforms, one platform for receiving a running web and other platform for a new web, a delivering platform for delivering running web, a space defining a splicing area between the delivering platform and the receiving platform, an adjusting means for moving, adjusting, and maintaining the delivering platform and one of the receiving platforms in-line with each other, a  
15 clamping means for each platform for clamping the webs during splicing, a shearing blade for cutting a trailing edge of a finished running web held between the delivering platform and the receiving platform by clamping means, at-least one dispenser arranged to travel in cross machine direction within the said space so as to splice trailing edge of a running web and a leading edge of a new web and a  
20 controller to facilitate clamping, cutting and splicing of the webs.

According to one embodiment of the system of the present invention, either receiving platform or delivery platform is mounted on the adjusting means.

Advantageously, the receiving platforms are adapted on the adjusting means for

moving and bringing one of the receiving platform in-line with the delivering platform.

Alternatively, the delivery platform can be adapted on the adjusting means for moving to bring in-line with one of the receiving platform.

According to the present invention, the controller includes a sensor for each web  
5 adapted on the running path of web in the unwinding section to sense and activate the controller as the web is finished.

According to another embodiment of the system of the present invention, the system comprises two dispensers, arranged above and below running web within the space to apply adhesive tape from top and bottom simultaneously. The dispenser  
10 comprises a one-sided adhesive tape, a rubber roller to apply pressure over the adhesive applied web edges, and a vacuum pad to hold front end of the adhesive tape having adhesive side facing towards the web.

According to one another embodiment of the system of the present invention, at least one of the dispensers includes a cutter for cutting the adhesive tapes after  
15 splicing. Advantageously, the cutter is adapted in a top dispenser to cut the adhesive tape after splicing.

According to further embodiment of the system of the present invention, the system comprises a holding means for holding corners of the leading edge of a new web and the trailing edge of a finished web and front edge of the adhesive tape together  
20 while splicing the webs.

According to further another embodiment of the system of the present invention, the system optionally comprises an accumulator to accumulate the spliced web enough to supply web continuously to the utilizing machine during splicing operation.

In a second aspect, the present invention provides a method for automatic web splicing comprising the steps of sensing that running web core is finished , clamping the finished web using clamping means, cutting the finished web; aligning and adjusting leading edge of a new web in-line with a trailing edge of the finished web,  
5 applying an adhesive tape over the aligned webs and pressing the applied adhesive tape simultaneously, and cutting the adhesive tape thereby effecting the splicing of the web.

In preferred embodiment of the method of the present invention, the step of applying adhesive tape includes a step of holding the corners of the leading edge of a new  
10 web and the trailing edge of a finished web and front edge of the adhesive tape.

According to the present invention, the method preferably applies adhesive tape on top and bottom of the webs simultaneously.

According to the present invention the splicing speed of the system is dependent on speed of an utilizing machine.

#### 15 BRIEF DESCRIPTION OF THE DRAWINGS:

Reference will be made to embodiments of the invention, examples of which may be illustrated in the accompanying figures. These figures are intended to be illustrative, not limiting. Although the invention is generally described in the context of these embodiments, it should be understood that it is not intended to limit the scope of the  
20 invention to these particular embodiments.

The above and other objects, features and advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawing, in which:

Figure 1 shows an automatic splicing system according to the present invention;

Figure 2 shows a block diagram of automatic splicing system according to the present invention;

Figure 3 shows a splicing section of the automatic splicing system according to the present invention;

Figure 4 shows a top dispenser as per a preferred embodiment of the present invention;

Figure 5A-5D shows side views of splicing section of the automatic splicing system of the present invention, where:

Figure 5A shows a position of the dispenser before moving in cross machine direction;

Figure 5B and 5C shows movements of dispenser after moving in cross-machine direction;

Figure 5D shows a position of dispenser moving in opposite cross-machine direction after tape pasting.

#### DETAILED DESCRIPTION OF THE INVENTION:

Hereinafter, the preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. Reference now should be made to the drawings, in which the same reference numerals are used throughout the different drawings to designate the same or similar components.

The present invention provides a system for automatic web splicing for providing continuous flow of web to a utilizing machine. The system joins the two webs in

completely auto mode and keeps the utilizing machine running continuously without stoppage.

Figure 1 and Figure 2 show an automatic web splicing system according to a preferred embodiment of the present invention.

- 5 The automatic splicing system (100) comprises an unwinding section (110), a splicing section (120), an accumulator (130) and a controller (140) to facilitate clamping, cutting and splicing of the webs to provide continuous web supply to a utilizing machine.

As shown in Figure 1, the unwinding section (110) comprises two spindles (112a, 112b) for mounting web cores (114a, 114b) and two running paths (a, b) guiding the webs (115a, 115b) to splicing section. Sensors (116a, 116b) are mounted on the running path of each web (115a, 115b). For sake of explanation, webs adapted to the web cores (114a, 114b) may be referred as running web (115a) and new web (115b). Further, as shown in Figure 1, the system comprises of an accumulator  
10 (130). The accumulator (130) is adapted generally below the splicing section (120) to accumulate the web (115) enough to supply the web continuously to a utilizing machine to avoid the stoppage of machine.

Figure 3 and Figure 5 show the splicing section as per a preferred embodiment of the present invention.

- 20 Referring at this point to Figure 3 which shows the splicing section (120) comprising of a delivering platform (124) and at-least two receiving platforms (122a, 122b) – a first receiving platform (122a) for a running web (115a) and a second receiving platform (122b) for a new web (115b), and a shearing blade (127) for cutting a

trailing edge of a finished running web (115a) held between the receiving and delivering platform by clamping means (125 a, 125b, 125). The clamping means (125a, 125b, 125) clamp the webs while splicing the webs.

Further, the delivering platform (124) and receiving platforms (122a, 122b) are  
5 adjusted and maintained in-line with each-other via an adjusting means. The adjusting means moves the platform preferably in a vertical direction. According to the present invention, the receiving platforms (122a, 122b) or the delivering platform (124) may be adapted to the adjusting means. As shown in the Figures 3, and as per the preferred embodiment of the invention, the delivering platform (124) is fixed  
10 and the receiving platforms (122a, 122b) are movable by adapting it to the adjusting means for moving and bringing one of the receiving platforms (122a, 122b) in-line with the delivering platform (124) for splicing. As shown, a space (x) defines a splicing area between the receiving platform (122a, 122b) and the delivering platform (124) depending on width of an adhesive tape. According to the invention,  
15 the adhesive tape is dispensed from at-least one dispenser. According to the present invention, the splicing system comprises two dispensers arranged above and below the space defined between the delivering and receiving platforms.

Figure 4 shows the top dispenser (128a) of the present invention. The dispenser (128a) comprises one side adhesive tape roll (10a), a rubber roller (20a) to apply  
20 pressure and a vacuum pad (22) to hold adhesive of the adhesive tape facing towards the web. As shown in Figure 4, a cutter (129) is also adapted in the top dispenser to cut the adhesive tape (10a). Alternatively, a cutter can be adapted in the bottom dispenser.

Figures 5A to 5D show side views of operation of an automatic splicing system as per a preferred embodiment of the present invention showing dispensers (128a, 128b) adapted on a rod-less cylinder unit to allow the dispensers to move in a cross-machine direction for splicing. Figures 5A to 5D also shows holding means (127) for  
5 holding corners of the leading edge of a new web and the trailing edge of a finished web and front edge of the adhesive tape together while splicing the webs. As shown, each dispenser (128a, 128b) comprises one side adhesive tape roll (10a, 10b), a rubber roller (20a, 20b) to apply pressure, and a vacuum pad (22) to hold front end of the adhesive tape (10a, 10b) facing towards the web. A cutter (129) is  
10 adapted in one of the dispenser to cut the adhesive tape (10a, 10b) to cut the adhesive tape after splicing.

Figure 1 and Figure 5A-5D illustrates operability method of the automatic splicing system, wherein, a web core (114a) mounted on spindle (112a) is running through a first receiving platform (122a), delivering platform (124) and accumulator (130),  
15 while web core (114b) mounted on another spindle (112b) is readily mounted on the second receiving platform (122b). During this period, the splicing section (120) is inactive as showing in figure 5A and allows the running web (115 a) to pass to a utilizing machine.

As the running web (115a) on web core (114a) finishes, the sensor (116a) mounted  
20 on the running path of the unwinding section for said web (115a) senses that the web (115a) on the core (114a) is finished and accordingly passes the information to the controller (140) which activates the clamps (125a) on receiving platform (122a) and the clamp (125) on delivering platform (124) to clamp the running web as well

as activates the accumulator (130). As soon as the web (115a) is clamped between the two clamps, the shearing blade (126) activates and cross cuts the clamped web. After cutting, an adjusting means moves the receiving platforms (122a, 122b) so as to adjust the receiving platform (122b) in-line with the delivering platform (124) thereby bringing leading edge of the new web (115b) in-line with the cut edge i.e. trailing edge of the finished web. The dispensers (128a, 128b) then moves in cross machine direction on the rod-less cylinder unit as shown in Figure 5B and 5C, and comes in contact with the holding means (127) which hold the free edges of the adhesive tapes (10a,10b) having adhesive face over the edges of the leading and trailing web from longitudinal side of the webs and then dispensers (128a, 128b) moves in the opposite direction as shown in Figure 5D applying the adhesive tape (10a, 10b) and pressing the adhesive tape simultaneously by rubber rollers (20a, 20b) applied over the web edges thereby butt splicing the web edges from both sides i.e. top and bottom side. On splicing, the cutter (129) adapted in the upper dispenser (128a) cuts the adhesive tape and splicing is completed thereby forming a continuous web. After completion of the splicing, clamps over the running web frees the web and the machine starts drawing of web from the new web core. Similarly, when a running roll is processed and finished, the sensor passes a signal to the controller and the controller changeovers to a new web by clamping, cutting and splicing the running web with next web and keeps the machine running.

According to the present invention the splicing speed of the system depends upon speed of the utilizing machine. In this aspect, the splicing system does not require its own drive. For example, for a laminate printing machine operating at tension 5kg

and having a printing speed of 80 meters/min, splicing system of the present invention requires total cycle time of about 4 to 6 seconds depending on width of web for splicing.

Advantageously, the present invention provides auto splicing along with increase in  
5 machine up time, reduction in scarp, reduction in man-hours, improved quality of joint, elimination of paper shifting, as well as elimination of breakage of papers by providing a quality of joint on both side of the web along with improved strength. Further, the splicing system of the present invention is a compact machine which can be easily adapted to on an in-use continuous plastic or paper web processing  
10 machine without major modifications.

### Claims

1. A system for automatic web splicing adapted on a running path of a web between an unwinding section and a utilizing machine for providing continuous flow of web to the utilizing machine, said system comprising:
  - 5 at least two receiving platforms, one platform for receiving a running web and other platform for a new web;
  - a delivering platform for delivering running web;
  - a space defining a splicing area between the delivering platform and the receiving platform;
  - 10 an adjusting means for moving, adjusting, and maintaining the delivering platform and one of the receiving platforms in-line with each other;
  - a clamping means for each platform for clamping the webs during splicing;
  - a shearing blade for cutting a trailing edge of a finished running web held between the delivering platform and the receiving platform by clamping means;
  - 15 at-least one dispenser arranged to travel in cross machine direction within the said space so as to splice trailing edge of a running web and a leading edge of a new web with an adhesive tape; and
  - a controller to facilitate clamping, cutting and splicing of the webs.
2. A system for automatic web splicing as claimed in claim 1, wherein the receiving  
20 platforms is adapted on the adjusting means for moving and bringing one of the receiving platform in-line with the delivering platform.

3. A system for automatic web splicing as claimed in claim 1, wherein the delivering platform is adapted on the adjusting means for moving and bringing in-line the delivering platform with one of the receiving platform.
4. A system for automatic web splicing as claimed in claim 1 wherein the controller  
5 includes a sensor for each web adapted on the running path of web in the unwinding section to sense and activate the controller as the web is finished.
5. A system for automatic web splicing as claimed in claim 1, wherein the dispenser comprises a one-sided adhesive tape, a rubber roller to apply pressure over the adhesive applied web edges, and a vacuum pad to hold front  
10 end of the adhesive tape having adhesive side facing towards the web.
6. A system for automatic web splicing as claimed any one of the preceding claims, wherein the system preferably comprises two dispensers, arranged above and below running web within the space to apply adhesive tape from top and bottom simultaneously.
- 15 7. A system for automatic web splicing as claimed in claim 6, wherein at-least one of the dispensers includes a cutter for cutting the adhesive tape after splicing the webs.
8. A system for automatic web splicing as claimed in claim 7, wherein the cutter is preferably adapted in a top dispenser to cut the adhesive tape after splicing.
- 20 9. A system for automatic web splicing as claimed in claim 1, wherein the system comprises a holding means for holding corners of the leading edge of a new web and the trailing edge of a finished web and front edge of the adhesive tape together while splicing the webs.

10. A system for automatic web splicing as claimed in claim 1, wherein the adjusting means moves the platform preferably in a vertical direction.
11. A system for automatic web splicing as claimed in claim 1 further comprises an accumulator to accumulate the spliced web enough to supply web continuously to the utilizing machine during splicing operation.
12. A system for automatic web splicing as claimed in claim 1, wherein the unwinding section comprises a spindle corresponding to each receiving platform for mounting a web core of running web and a web core of new web, a running path for each web.
13. A method for automatic web splicing comprising the steps of:
- sensing that running web core is finished ;
  - clamping the finished web using clamping means;
  - cutting the finished web;
  - aligning and adjusting leading edge of a new web in-line with a trailing edge of the finished web;
  - applying an adhesive tape over the aligned webs and pressing the applied adhesive tape simultaneously; and
  - cutting the adhesive tape thereby effecting the splicing of the web.
14. A method for automatic web splicing as claimed in claim 13, wherein the step of applying adhesive tape includes a step of holding the corners of the leading edge of a new web and the trailing edge of a finished web and front edge of the adhesive tape.

15. A method for automatic web splicing as claimed in claim 13, wherein the adhesive tape is preferably applied on top and bottom of the webs simultaneously.

16. A method for automatic web splicing as claimed in claim 13, wherein speed of  
5 splicing is dependent on speed of an utilizing machine.

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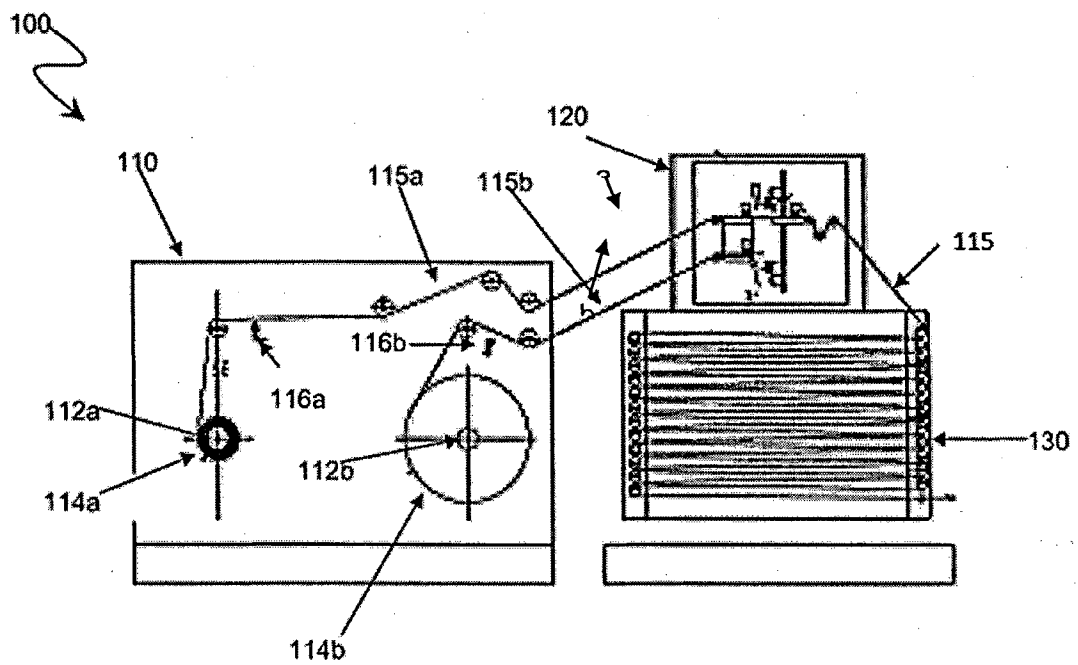


FIGURE 1

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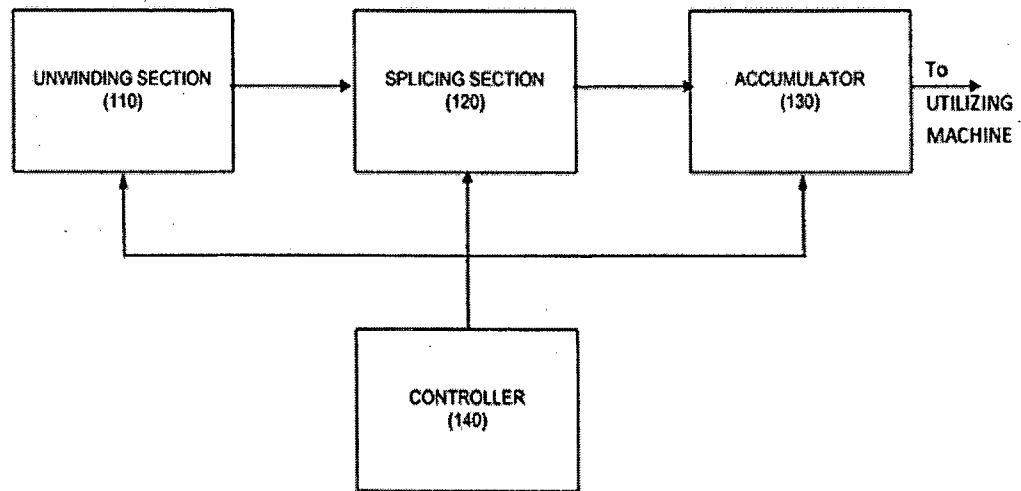


FIGURE 2

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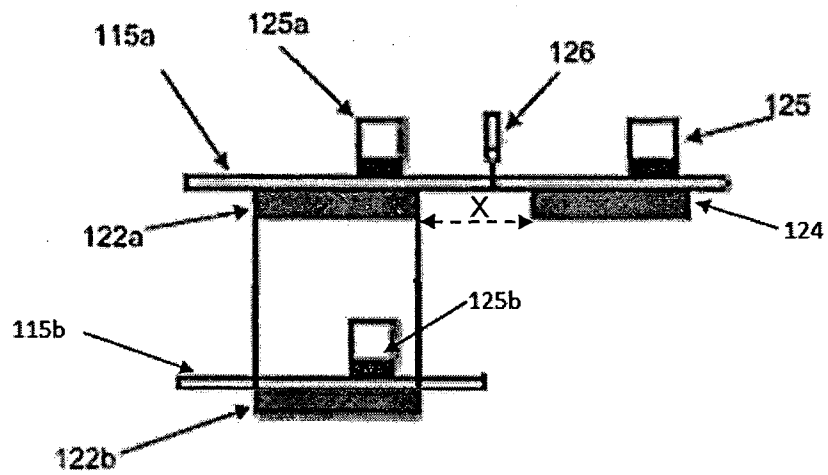


FIGURE 3

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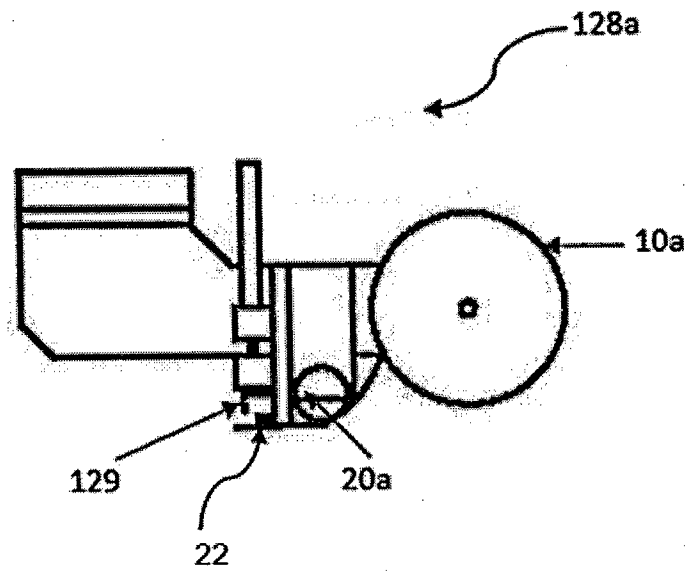


FIGURE 4

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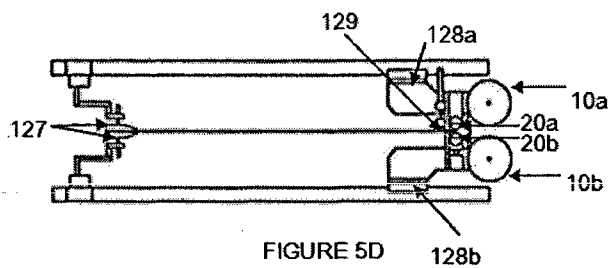
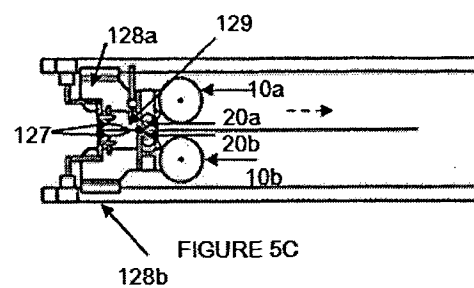
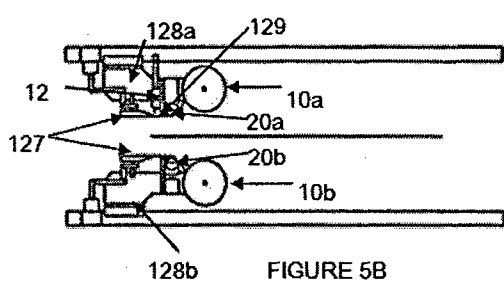
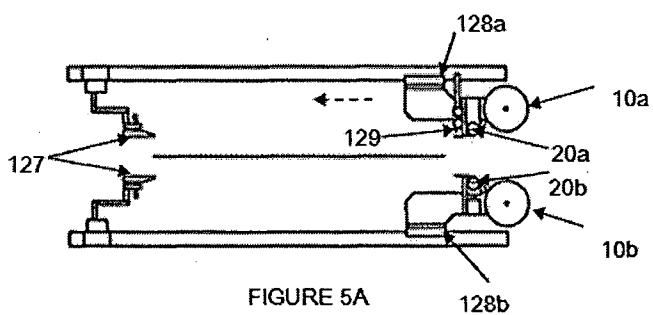


FIGURE 5