April 11, 1967 T. J. HYJEK 3,313,391

WEB CARRIED CONTROL STRUCTURE

Filed April 16, 1964

FIG. 3.

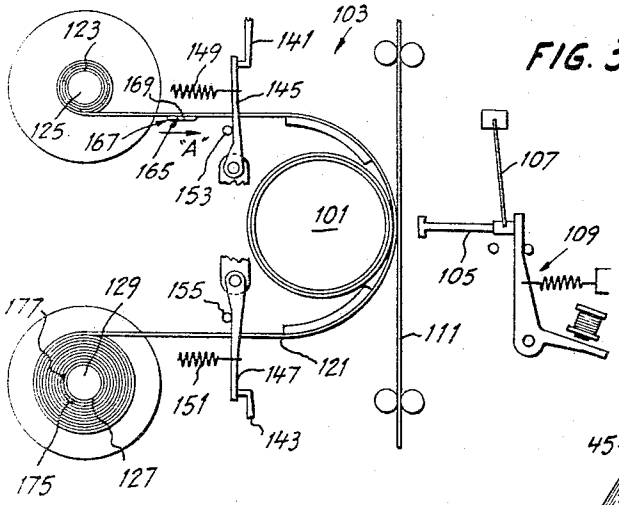


FIG. 2.

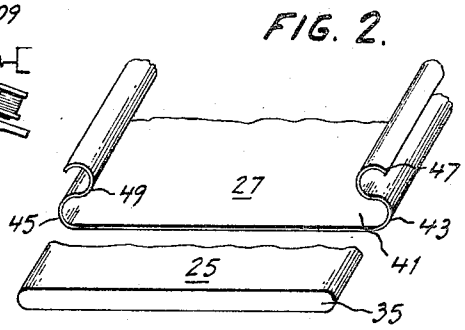


FIG. 1.

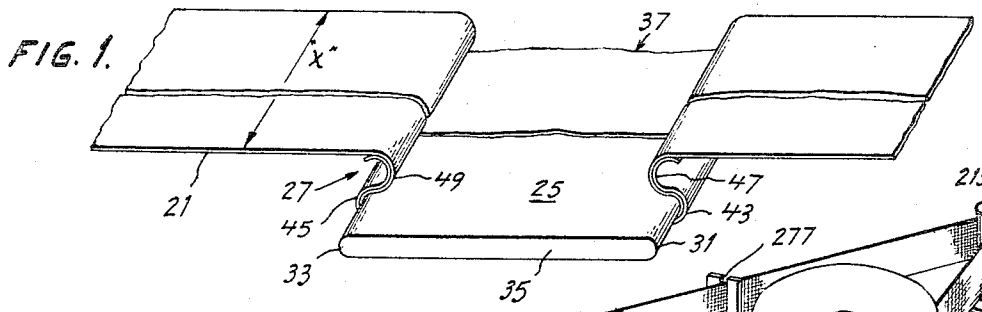
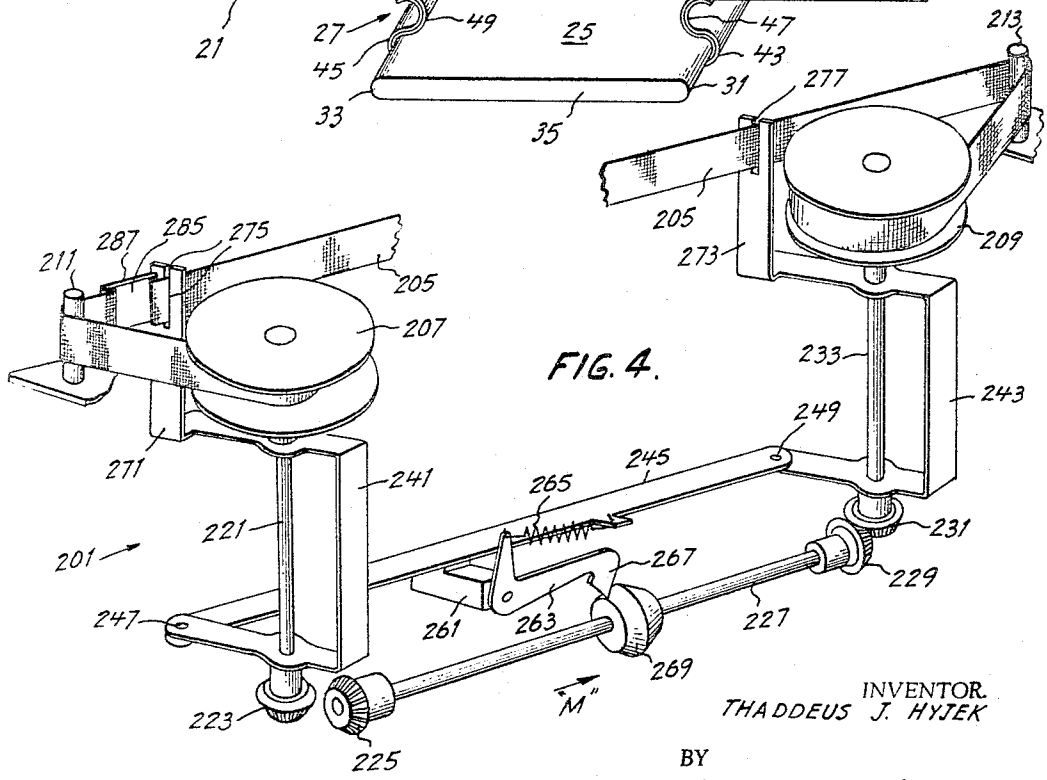


FIG. 4.



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WEB CARRIED CONTROL STRUCTURE

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This invention relates to ribbon-like webs of material disposed for movement along predetermined paths, and more particularly to control structures carried by such webs and movable thereby into designated positions within said predetermined paths to effect operation of control devices.

Ribbon-like webs of material are found in many forms and are used in many diverse environments both by the consumer and by industry. Webs of film are used for the taking and showing of motion pictures and for the storage and retrieval of information, as on microfilm. Webs of magnetizable material may also be used for information storage and retrieval, as well as for the recording and playing of music, lectures, and the like. Webs of punched tape find such wide uses as controlling office accounting machines and complex machine tool operations. Webs of various materials are extensively used in conveyor systems to move articles from one location to another, while webs of inked material are employed in many varieties of printing instrumentalities ranging from the typewriter and calculator which use narrow strips of inked material, to high speed printers which require that such inked material be in the form of a wide band. These examples of ribbon-like webs of material are not intended to be exhaustive but merely to illustrate the range of uses for a ribbon-like web of material and the variety of materials from which such a web may be formed.

In some instances the web of material is of the endless type while in other instances it is disposed for movement between a pair of spools. In either instance the web is often disposed for passage along a predetermined path wherein successive portions of the web are passed through a work station. The work station may constitute that location within the equipment wherein light is impinged upon the web if it be film, where a magnetic head is in proximity to the web if it be magnetizable type, or where character bearing instrumentalities are impacted against the web if it be an inked ribbon.

In some equipment it is necessary to ascertain the position of the web with respect to the work station in advance of the approach of predetermined portions of the web thereto so that particular control devices are operated in time to insure proper operation of the equipment. Such operations may include, amongst other things, the flashing of a light to expose or project an image, the opening of a chute to permit movement of a transported article in a particular direction, the actuating of an item counter, or the changing of the speed of travel of the web. If the web is disposed for movement between a pair of spools, information concerning the relative disposition of the web with respect to the spools (i.e. how much web is on each spool and especially whether either end of the web is nearly unwound from its respective spool) is essential for proper operation of many types of equipment.

When the web is of the endless type an indication of the relative position thereof is conventionally obtained by

sensing a control mark either cut into or punched from the web. In the case of a web disposed for movement between a pair of spools, an indication of the relative position thereof is conventionally obtained by sensing the amount of web remaining upon each spool. The sensing mechanism in turn either operates an indicating device or exercises a direct control over the web feed mechanism or some other mechanism of the equipment. Such sensing mechanisms are usually quite complex in construction and operation and add heavily to the cost of the equipment. Furthermore, the cut or punched mark requires a permanent mutilation of the web; while mechanism which senses the amount of web upon a spool depends for its accuracy upon the manner in which the spool has been wound; if wound too tight the control is operated permaturely, if wound too loose the control is operated too late.

Some equipment manufacturers avoid the expense, web damage, and possible improper machine operation inherent in the use of the aforementioned web sensing mechanism by attaching to the web one or more control members and by providing the equipment with means to sense the presence of such control members. The control members at times take the form of an eyelet imbedded in predetermined locations on the web and at other times that of a rod, plate, or other mass attached to the web at predetermined locations thereon. Such control members almost invariably extend either above or below the surface of the web and sometimes they project beyond either one or both edges of the web. In all instances in order for such control members to be effective they must be secured in place on the web so that when the control member comes under the influence of the sensing mechanism it does not move, bend, or cause an inadvertent movement of the web itself. It has therefore become common practice to attach the control member to the web in a substantially permanent manner as by sewing the web material thereabout, or by bolting, riveting, etc., the control members to the web. For some types of web material such as photographic film, the nature of the material is such that it is not readily susceptible to these aforementioned common ways of securing the control members in place and therefore this form of control structure cannot be used therewith. In most other types of web material the control members when secured in place cannot be removed without either damaging the web of material, the control member, or both.

Attempts have also been made to adhesively secure the control members in place on the web but if the adhesive is strong enough to be effective it cannot be removed without damaging the web of material, and if the adhesive is of the type which permits ready removal of the control members from the web it is not strong enough to effectively maintain the control members in proper position on the web.

It is therefore an object of this invention to provide an improved manner of securing one or more control members to a web of material.

Another object is to provide an improved manner of securing one or more control members to a web of material such that the control members can be readily secured to the web and readily removed from the web without damaging either the web or the control members.

Yet another object is to provide an improved ribbon-like web of material having removably disposed thereon control structure adapted for coaction with a sensing

mechanism, when the web is moved along a predetermined path, to effect operation of a control device when a predetermined portion of such web arrives at or passes through a designated portion of said predetermined path.

Still another object is to provide an improved ribbon-like web of material with removable control structure adapted for coaction with a control device, when the web is fed along a predetermined path and between a pair of spools, to thereby effect operation of such control device when a predetermined portion of such web arrives at or passes through a designated position within said predetermined path.

A still further object is to provide an improved ribbon like web of material with control structure removably secured near the ends thereof and adapted for coaction with a control device, when the web is fed bi-directionally between a pair of spools, to effect operation of said control device and reverse the direction of feed of the web feed mechanism and therefore of the web prior to the end of the web becoming unwound from its respective spool.

This invention involves ribbon-like webs of material disposed for movement along predetermined paths and contemplates removably securing to such webs of material, in predetermined positions thereon, control members adapted for coaction with sensing mechanisms which upon sensing the presence of any such control member actuates a control device. In carrying out the invention, according to a preferred embodiment, the control members take the form of rigid bars which project beyond either the surfaces or the edges of the web of material or both, and which are removably secured to the web of material by the use of spring clips thereby facilitating the attachment of the control members to the web and the removal of the control members from the web without damage to either the control members or the web.

Features and advantages of the invention will be seen from the above, from the following description of the preferred embodiment when considered in conjunction with the drawing, and from the claim.

In the drawing:

FIG. 1 is an enlarged fragmentary perspective view of a web of material with a control member embodying the present invention, secured thereto;

FIG. 2 is a fragmentary perspective view of the control member of FIG. 1 removed from the web of material;

FIG. 3 is a schematic of a high speed printer showing a web of material, in the form of an inked ribbon, disposed for bi-directional movement between a pair of ribbon spools and carrying a pair of control members such as that shown in FIGS. 1 and 2; and

FIG. 4 is a schematic of a bi-directional feed mechanism for a web of material in the form of an inked printing ribbon, showing a modified form of control member removably secured thereto.

For convenience the invention will be described as applied to a ribbon-like web of inked material of the type commonly disposed in printing instrumentalities for bi-directional movement between a pair of ribbon spools; it being understood nevertheless that without departing from the scope of the invention that subject removable control members can be applied to any web of material regardless of the type of material thereof and regardless of the manner in which the web is disposed for movement.

With reference to FIG. 1 the number **21** generally designates a ribbon-like web of inked material. A control strip **25** is secured to web **21** by an anchor clip **27**.

Control strip **25** is formed from rigid stock such as steel, aluminum, etc., and with one pair of opposite edges, **31** and **33** respectively, parallel to each other and slightly curved so as to smoothly intersect the top and bottom surfaces of strip **25**. The other pair of opposite edges, **35** and **37** respectively, are also formed parallel to each other. The distance between edges **35** and **37** of strip **25** is greater in dimension than the width *x* (FIG. 1) of web **21** so that either edge **35** or edge **37** or both may extend beyond the edges of web **21**.

Anchor clip **27** is formed of resilient or spring material such as beryllium copper, or of material treated after forming to have resilient or spring characteristics, and of a modified U-shaped configuration so as to provide a channel portion **41** (FIG. 2) having a pair of curved sides **43** (FIGS. 1 and 2) and **45** terminating in curved lips **47** and **49** respectively. Sides **43** and **45** of anchor clip **27** are curved to a shape similar to that of edges **31** and **33** of control strip **25** for better coaction therewith.

To install control strip **25** at a predetermined location on web **21** one need only set lips **47** and **49** of anchor clip **27** against one side of web **21** and place control strip **25** against the other side of web **21** and in alignment with channel **41** and press control strip **25** and anchor clip **27** towards each other with sufficient force to spread lips **47** and **49** of anchor clip **27** and seat control strip **25** in channel **41** with web **21** disposed therebetween. The resilient spring action of anchor clip **27** is sufficient to firmly secure control strip **25** in place and prevent either web **21** or control strip **25** from moving with respect to each other, or control strip **25** and anchor clip **27** from moving with respect to web **21**. The force required to grip web **21** and prevent relative movement between same and control strip **25** will depend upon the forces which will be applied to control strip **25** during the intended application thereof and the normal tension forces to be applied to web **21**, and may be easily obtained by forming anchor clip **27** with appropriate spring characteristics.

Removal of control strip **25** is accomplished by merely applying sufficient tension to web **21** to spread lips **47** and **49** of anchor clip **27**, straighten web **21**, and pop control strip **25** out of channel **41**; or by otherwise applying sufficient force to lips **47** and **49** of anchor clip **27** to spread same and permit removal of control strip **25**.

It should thus be obvious that due to the configuration of control strip **25** and anchor clip **27** and to the described manner of installing same onto web **21**, that neither web **21**, control strip **25**, nor anchor clip **27** will be damaged during the installation or removal processes regardless of how often repeated. Although control strip **25** has been shown with a substantially rectangular cross-section and with parallel sides, it should be obvious that the cross-section thereof could just as well be square, triangular, round, or any other convenient configuration and that the sides need not be parallel; with the configuration of anchor clip **27** conforming thereto. Furthermore, either edge **35** or edge **37** of control strip **25**, or both of them, or the entire control strip **25**, may be utilized to effect operation of a control device.

In the schematic of FIG. 3 there is shown a type wheel **101** of a conventional high speed printer **103** and a print hammer **105** biased away from type wheel **101** by a spring **107** and adapted for movement against type wheel **101** under impetus of a solenoid actuated armature **109**. A web of paper **111**, disposed between hammer **105** and type wheel **101**, is moved past type wheel **101** by appropriate paper feed mechanism. A web of inked material **121**, constituting a substantially conventional printing ribbon, is disposed between type wheel **101** and paper **111**. Web **121** is of the wide band type having a width which is coextensive with that of type wheel **101**. One end **123**, of web **121** is disposed about a ribbon spool **125** with the other end **127**, of web **121** disposed about a ribbon spool **129**. Spools **125** and **129** are alternately driven by an appropriate drive mechanism so as to feed web **121** bi-directionally along a path passing same between type wheel **101** and paper **111**. The drive mechanism is of conventional construction and adapted to be reversed by actuation of suitable electrical circuitry. A pair of switch actuating arms **141** and **143** are disposed to either

side of type wheel 101 and in engagement with a pair of trip arms, 145 and 147 respectively. A pair of springs 149 and 151 urge trip arms 145 and 147 respectively against a pair of stops 153 and 155.

A control strip 165 is secured to web 121, near end 123 thereof by an anchor clip 167 in the manner hereinbefore described for control strip 25, anchor clip 27 and web 21. An edge 169 of control strip 165 projects beyond the edge of web 121, in a manner similar to that of edge 35 of strip 25 (FIG. 1), and into the plane occupied by trip arm 145. Continued feed of web 121 in the direction of arrow A will eventually move control strip 165 against trip arm 145 pivoting same against the bias of spring 149 to operate switch actuating arm 141 and reverse the direction of feed of web 121. A control strip 175 is similarly secured by an anchor clip 177, near end 127 of web 121 for coaction with trip arm 147 and switch actuating arm 143 to again reverse the direction of feed of web 121; control strips 165 and 175 alternately effecting operation of their respective trip arms, 145 and 147, to perpetuate a bi-directional feed of web 121 without either end 123 or 127 thereof becoming unwound from its respective spool, 125 and 129.

Should it be desired to dispose of inked web 121 the user need only remove control strips 165 and 175 therefrom, as hereinbefore described for control strip 25, anchor clip 27 and web 21, and, since control strips 165 and 175 and their respective anchor clips 167 and 177 are intact and undamaged apply same to the replacement web 121. Furthermore, since web 121 also has not been damaged, if desired, it may be reinked by suitable equipment and saved for reuse.

FIG. 4 schematically shows a conventional ribbon drive mechanism 201 of the type commonly found in typewriters, computers, teletypewriters and the like. An inked ribbon in the form of a web 205, is disposed with its ends secured to a pair of ribbon spools 207 and 209 and guided for movement in a predetermined path by a pair of studs 211 and 213. A vertical shaft 221 having ribbon spool 207 affixed to one end thereof has a miter gear 223 affixed to the other end thereof. A miter gear 225 adapted for meshing engagement with miter gear 223 is disposed on a drive shaft 227 which also carries a miter gear 229. A miter gear 231 adapted for meshing engagement with miter gear 229 is affixed to one end of a vertical shaft 233 having ribbon spool 209 affixed to the other end thereof.

A pair of substantially U-shaped actuators 241 and 243, pivotally disposed about shafts 221 and 233 respectively, are interconnected by a bracket 245 attached thereto by a pair of pivot pins 247 and 249. A support 261 suitably secured to bracket 245 pivotally mounts a pawl 263. A spring 265 urges a nose 267 of pawl 263 against one of the faces of a double faced cone-cam 269 secured to drive shaft 227. A pair of arms 271 and 273 extending up from actuators 241 and 243 respectively are formed with slots 275 and 277 adapted to receive inked web 205.

A control strip 285 is disposed near each end of inked web 205 and secured in place by an anchor clip 287 in the manner hereinbefore described for control strip 25, anchor clip 27 and web 21. It should be noted that in this type of usage control strip 285 is of the same width as web 205 to facilitate entry thereof into ribbon spool 207.

Rotation of shaft 227 is imparted by enmeshed miter gears 229 and 231 to vertical shaft 233 which in turn draws inked web 205 from ribbon spool 207. Continued movement of inked web 205 results in engagement of control strip 285 and anchor clip 287 with arm 275 and a clockwise pivoting (FIG. 4) of actuator 241 about vertical shaft 221. Bracket 245 and pawl 263 are moved in the direction of arrow M by the pivoting action of actuator 241; nose 267 of pawl 263 rising upon the left face of cone-cam 269 rotating pawl 263 in the counterclockwise direction and against the bias of spring 265. After passing the high point of cone-cam 269, nose 263, due to the tension of spring 265, descends quickly along the right face of cone-cam 269 moving same and drive shaft 227 in the direction opposite that of arrow M, to move miter gears 229 and 231 out of mesh and to move miter gears 225 and 223 into mesh. With the meshing of gears 225 and 223 rotation of drive shaft 227 is imparted to vertical shaft 221 and thereby to ribbon spool 207 to wind web 205 thereon until the control strip 285 and anchor clip 287 disposed at the other end of web 205 engages and operates arm 273 and actuator 243 to shift shaft 227 back to its FIG. 4 position.

Here again control strip 285 and anchor clip 287 may be removed from web 205 by merely applying pressure anchor clip 287 as hereinbefore sescribed (for control strip 25, anchor clip 27 and web 21) and extracting control strip 285 therefrom. Thus web 205 is rendered free of any control structure, to facilitate use thereof in a machine not requiring this type of control structure, or the reinking and subsequent reuse of web 205 if such be desired.

While the above examples both show the use of subject control structure to reverse the direction of web feed in a printing instrumentality it should be obvious that control strips similar to those shown in the drawing and hereinbefore described may be readily secured, by an anchor strip of the type shown and described, to any type of web whether it be film, magnetic tape, punched tape or conveyor strip and at any position thereon, to be moved thereby into coaction with suitable sensing mechanism and thereby control operation of any type of device. It should be further obvious that any such control strip and anchor clip may be readily detached from the web without damage to either the web, control strip, or anchor clip.

From the above description it will thus be seen that a novel and improved control structure has been provided for removable attachment to a web of material and for movement thereby into coaction with a sensing mechanism to effect operation of a control device; which control structure is easily and readily attached to such web at any predetermined location thereon without damage to either the control structure or the web and without specially forming the web to receive same. Subject control structure is furthermore also easily and readily detached from such web without damage to either the control structure or the web.

What I claim is:

A device adapted to be carried by a web of material at any preselected position thereon, said device comprising:

(a) a flat control strip adapted to be disposed in juxtaposition to and in engagement with a predetermined portion of the web of material,

(b) said strip including opposing parallel planar side portions, one of said side portions engaging the web and extending at least from one edge of the web to the other edge thereof,

(c) said strip further including outwardly curved end edge portions interconnecting said side portions, and

(d) a resilient anchor clip formed with a channel portion for cooperating with said control strip to secure said strip to the web of material,

(e) said clip including opposing side portions curved to a shape corresponding to the curved end portions of said strip for snug registration therewith,

(f) said clip having opposing integral tab members extending substantially the width thereof and including an arcuate transverse cross section whereby the combined cross section of the tab portions and the associated clip side portions are substantially S-shaped in configuration,

(g) said clip being formed from a material having resiliency characteristics which premit said strip to be firmly seated in said channel portion of said clip

to releasably secure the web of materials between said clip and said strip under conditions where the strip is urged into registration with said channel portion with a force sufficient to spread said opposing tab portions.

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