May 9, 1967 J. K. MACOMBER 3,318,549

WEB ATTACHMENT MEANS FOR SPOOLS

Filed Jan. 5, 1965 2 Sheets-Sheet 1

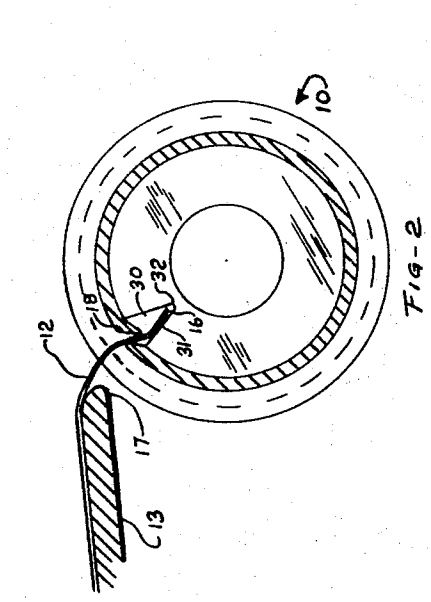


FIG-2

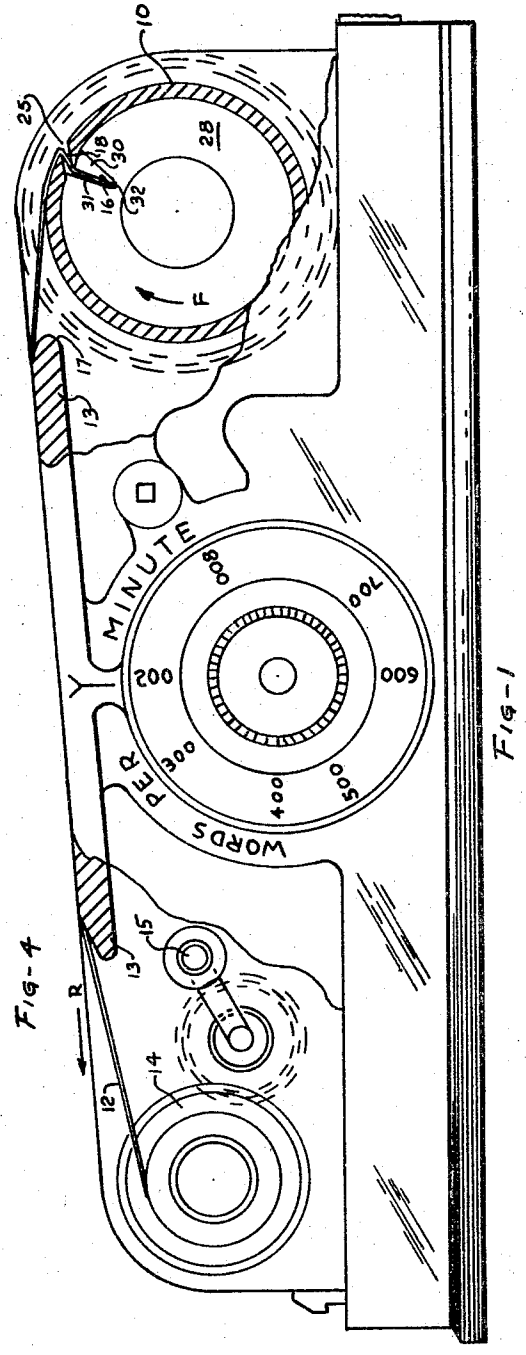


FIG-1

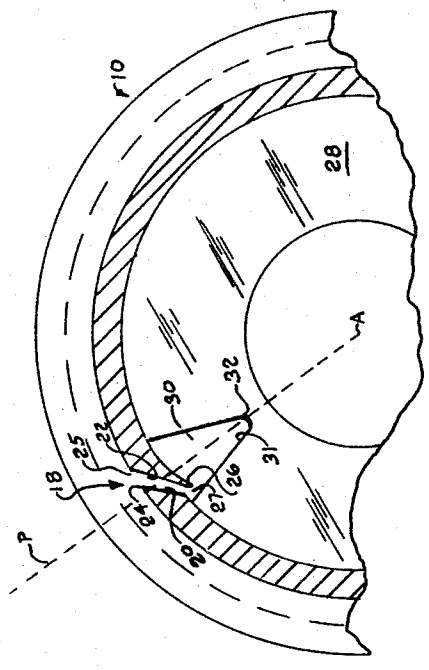


FIG-4

INVENTOR

JAMES KEITH MACOMBER

May 9, 1967 J. K. MACOMBER 3,318,549

WEB ATTACHMENT MEANS FOR SPOOLS

Filed Jan. 5, 1965 2 Sheets-Sheet 2

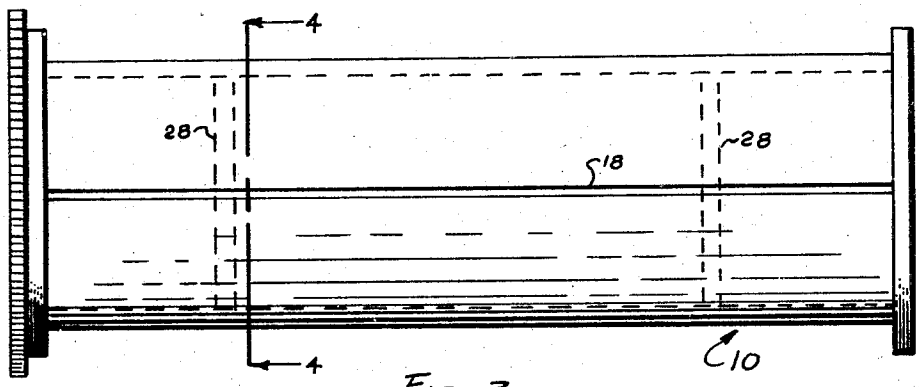


FIG-3

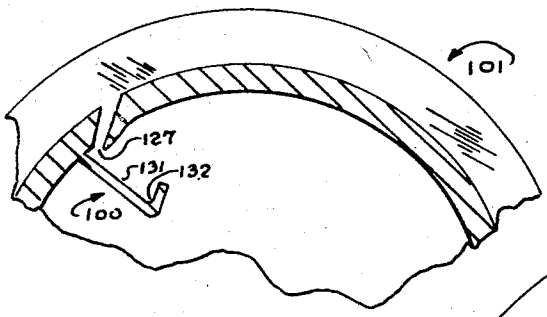


FIG-5

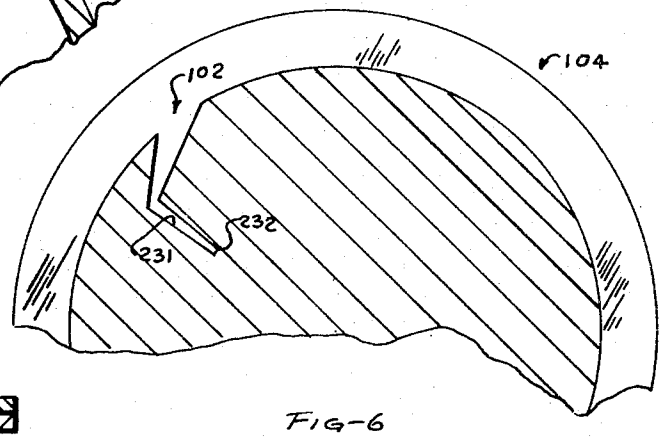


FIG-6

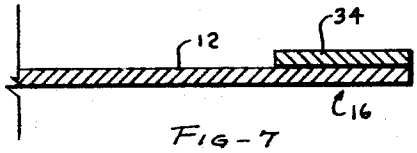


FIG-7

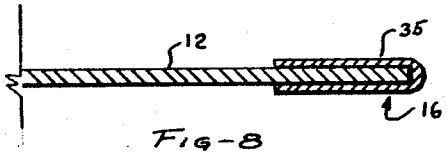


FIG-8

INVENTOR.
JAMES KEITH MACOMBER
BY
Edward Halle
ATTORNEY

United States Patent Office

3,318,549

Patented May 9, 1967

3,318,549

WEB ATTACHMENT MEANS FOR SPOOLS

James Keith Macomber, Rockville Centre, N.Y., assignor to Consolidated Lithographing Corporation, Long Island, N.Y., a domestic corporation

Filed Jan. 5, 1965, Ser. No. 423,496
3 Claims. (Cl. 242—74)

This invention relates to spools such as take-up spools, drums or reels provided with slotted means for attaching a web or ribbon of material to the said take-up spool, and in particular, to such take-up devices which are used in connection with types of machines such as reading machines or other devices in which a paper web is kept under tension, and in which it is important for the machine to have a good grip on the web at the start of the take-up of the web even before the take-up spool has made one complete revolution to self secure the end of the web around the take-up mechanism.

In an ordinary take-up drum of a spool having a slot for inserting the end of a web of paper, unless the spool is wound at least once, or indeed several times, the end of the paper web will ordinarily slip out of the slot. Prior to my invention, a web with program material could be securely attached to the take-up spool of a machine such as a reading machine only after the spool had been rotated more than one time to cause the web to overlap the insertion slot. If it was necessary to reroll the web back and forth on the machine for purposes of using the machine, without dislodging the end of the web from the take-up spool, the web would have to be stopped on the rewind at least one or more turns from the end of the web. This presents a distinct disadvantage in the mechanism of a machine such as a reading or teaching machine because in such a reading machine or reading pacer where webs of paper containing different printed programs are frequently changed, or in a teaching machine where webs containing different information must be used, it is most desirable to have a take-up spool in which the end of a web of paper can be inserted surely and securely without having to make one or more revolutions of the spool to insure that the end of the web will remain in position.

This is especially useful in a type of reading pacer such as that disclosed in my co-pending application Ser. No. 331,573 filed Dec. 18, 1963, where the motor mechanism of the device is rewound for each successive winding of a web by means of the operator rewinding the web manually by reversing the web supply roll with a crank or other suitable mechanism geared to the said web supply roll. Thus, the motor mechanism of the device is rewound by actually pulling or drawing the web back to unwind the web from the take-up spool. Without a means to hold the end of the web securely to the take-up spool, a position would be presented where the web would slip out at least before completing the final turn and leave the motor mechanism in an incompletely wound position. Thus, it is a definite advantage to provide a take-up spool having means to hold the end of the web securely as described herein.

It is, therefore, an object of this invention to provide a take-up spool for a web or ribbon of material having improved slotted means for gripping the end of the said ribbon or web of material without the necessity of making at least one complete revolution of the web around the spool for such gripping purposes.

It is a further object of this invention to provide a take-up spool having such improved sloted means comprising bearing areas for gripping the end of a web or ribbon of material.

It is another object of this invention to provide such a spool having slotted means which will effectively engage

the end of a web or ribbon of material against the pulling tension of the web until the web is completely unwound.

It is still another object of this invention to provide a take-up spool with a slotted means which will allow the pulling tension of the web to safely cause the end of the web or ribbon of material to disengage from the slotted means without tearing or other damage when the web is completely unwound from the take-up spool.

It is also an object of this invention to provide a take-up spool for an apparatns in which a spring motor is rewound by unwinding the said take-up spool, said spool having web gripping means sufficient to hold against the tension necessary to rewind the motor so that the web will not be released until the motor is completely rewound and the web take-up spool has returned to its original or starting position.

Other objects and advantages will appear in the specification hereinbelow. These objects and advantages are achieved with the type of take-up device illustrated in the accompanying drawings in which:

FIG. 1 is a side elevational view, partly in phantom and partly cut away;

FIG. 2 is a detail view taken from FIG. 1 showing the take-up spool at the first or web inserting position;

FIG. 3 is a top plan detail of the spool of the invention;

FIG. 4 is an enlarged sectional detail of the spool along the lines 4—4 in FIG. 3, with parts cut away;

FIG. 5 shows a sectional detail, similar to FIG. 4, through an alternate form of spool;

FIG. 6 shows a sectional detail, similar to FIG. 4, through another alternate form of spool;

FIG. 7 shows an end of a web in section; and

FIG. 8 is a view similar to FIG. 7 of an alternate form of web end.

Similar numerals refer to similar parts throughout the several views.

For purposes of illustration only, I show a preferred form of the invention in the figures as it is used and installed in a device such as the reading pacer disclosed in my said co-pending application, Ser. No. 331,573. It is unnecessary to duplicate the entire mechanism of the reading pacer device herein. It is sufficient to state that in such a device, the take-up spool **10** is connected by a suitable gear train or other means to a power means such as a spring wound motor, and will normally be urged by the said power means to rotate in the direction of arrow F as shown in FIG. 1 of the drawings. This direction of rotation is the forward direction of rotation, and will advance the web **12** from a supply reel **14** over a platen **13** and reel it onto the take-up spool **10**. The supply reel **14** has means, such as a crank **15** described in my co-pending application, to crank the web **12** back onto the supply reel **14** in a reverse direction, and when this is done, the movement of the web will reverse and go in the direction of arrow R as shown in FIG. 1 of the drawings, thus causing the take-up spool **10** to reverse and rewind the spring motor of the device.

There is also a suitable stop mechanism and governing mechanism, as described in my said co-pending application, to control and stop the action of the spring motor when it is desired to keep the web **12** from moving forward.

In order to prepare the device for operation, the spool **10** is turned by the palm of the hand to wind the spring motor. An end **16** of the web is then inserted into the slot **18** in the drum **10**. This is done when the slot **18** is at a first or web inserting position with relation to end **17** of platen **13**, as shown in FIG. 2 of the drawings. This may also be called the starting position. The spool **10** is then rotated by the motor in the direction of arrow

F and winds up the web **12** and reels it for the desired length, pulling the web **12** along the platen **13**. Then, when desired, the web **12** is cranked back to starting position, and this rewinding of the web **12**, under tension against the spring motor, at the same time rewinds the spring motor by means of the reverse action of the spool **10** so that when the next web **12** is inserted, the motor will be completely rewound.

It will be appreciated that if the end **16** of the web **12** should leave the slot **18** before the spool **10** is returned to starting position, as indicated in FIG. 2 of the drawings, the motor would not be completely rewound for the next use. Thus, after several uses of the device, the motor would become completely unwound and the device would be inoperative unless separate procedures were taken to fully wind the motor.

In the device of the invention, the web tension, while the take-up spool **10** is advancing in the direction of arrow F, is small compared to the tension while the web **12** is being reeled in reverse by the hand crank **15** in the direction of arrow R. The slotted means **18** of the invention holds web end **16** by means of the forces of friction against the end of the web **16** due to the construction and placement of the bearing means **24**, **26** and **31** of the device. In the operation of the device, the tension exerted on the web during the rewind operation, in the direction of arrow R, is much greater than the tension exerted on the web when it is reeled forward by the action of the spring motor in the direction of arrow F. Therefore the grip applied by the slotted means **18** to the web **12** does not need to be as strong when the web **12** advances forward, as when it is reeled in reverse.

When a web end **16** is inserted into the slotted means **18** at the first or starting position, and the spring motor is started, the slotted means **18** will exert sufficient friction immediately against web end **16** to prevent the web end **16** from slipping out when the spool **10** is turned forward in the direction of arrow F. When web **12** is cranked back onto supply reel **14** by means of crank **15**, and web **12** moves in the direction of arrow R, the tension on the web becomes much greater because the web **12** is pulling against the spring motor for purposes of rewinding same. This results in the frictional gripping action of the slotted means **18** becoming greater until the spool **10** comes back to first or starting position. At this point, because of the relation of slotted means **18** and the platen end **17**, the web **12** approaches perpendicularity with the surface of the spool **10**, and the friction of the slotted means **18** becomes less than the tension on the web, and web end **16** pulls out of the slot **18**. Thus, while the friction of the slotted means **18** is sufficient, while in position as shown in FIG. 2 of the drawings, to advance the web **12** when under low tension, it is insufficient to hold the web **12** against the high tension of the reversing process, it being understood that this last statement applies only when the spool **10** is in starting position as shown in FIG. 2.

These results are accomplished by providing the slot **18** with walls **20** and **22** respectively which are oblique to any plane P (one of which is illustrated by dotted line in FIG. 4) passing through the slot **18** and also including the axis A of the spool **10**. Because its walls **20** and **22** are slanted or oblique to every plane P passing through the axis and the slot, slot walls **20** and **22** will provide web bearing means such as an edge, or corner **24** at the slot outer entrance, or outer opening **25**, and web bearing means such as an edge, or corner **26** at the slot inner entrance, or inner opening **27**, for frictionally holding the web.

In addition, at least one partition **28** is located within the spool **10** with a cut portion **30**. I prefer to make this cut portion in a generally V shape to provide a bearing means, such as an arm or surface **31** and a web end stop means **32**. The V shaped cut **30** is placed internally in the spool **10** with relation to the slot **18** so that the cutout portion **30** is in the position generally as shown in FIGS. 1, 2 and 4 of the drawings.

Reference to the drawings will show that side **31** of the V has its outermost end substantially adjacent the inner opening of slot **18**. It should also be noted that the juncture of said outermost end of side **31** is on the opposite side of the slot **18** from bearing edge **26**. It is to be noted that side **31** forms a bearing means or surface which is at an angle to the slot **18**. This is an angle of less than 180 degrees, and in the invention as illustrated in the drawings, is an obtuse angle. The reason for this specific type of construction will become apparent hereinbelow when the function of the device is described.

This is a preferred form of construction. The cuts **30** in partitions **28** could be replaced with any other type of construction which will provide the bearing surface side, or ledge **31**, for the end **16** of the web **12**. For example, reference to FIG. 5 of the drawings shows an alternate form as a bearing arm **100** molded or fixed to the inside of a hollow spool **101** near the inner opening **127** being provided with a bearing surface **131** and web stop means **132**, and in FIG. 6 of the drawings, an elbowed slot **102** is shown in a substantially solid spool **104** having the inner web bearing surface **231** in an inner recess of the elbow, and web stop means **232**. The bearing means **31**, **131** or **231** may extend longitudinally along the length of the slot, as in forms **131** and **231**, or be a "narrow" edge surface of a cutout as in form **31**.

Thus, when end **16** of web **12** is inserted, the end **16** of web **12** will bear generally against corners **24**, **26** and bearing means **31** as shown in FIG. 2 of the drawings, and these will effectively grip the end **16** of the web **12** instantly as the spool **10** moves in the direction of arrow F.

Referring now to FIG. 2 of the drawings, we can see the position of the web and the drum at the time of insertion of the end **16** of the web **12** into slot **18** of the spool **10**. At this point, the spool **10** is in a first, starting, or web inserting position with the slot **18** at a point of circumference of the spool near the end **17** of platen **13** of the device. The slot entrance **25** will be facing the platen end **17** and will be ready to receive web end **16**. The relaxed end **16** of the web **12** is pushed or inserted into slot **18** until it touches bearing means edge **31** of V shaped cut **30**. This causes end **16** to bend because of the angle of bearing edge **31** with relation to the walls of slot **18**, engaging the bearing corners or points **24**, **26** and bearing edge surface **31**. In FIG. 5 of the drawings, bearing surface **131** is shown at an obtuse angle to the slot associated with it, and in FIG. 6 of the drawings, bearing surface **231** is shown at an obtuse angle to the slot associated with it. Thus, end **16** will bend in the same manner in these forms of the invention as in the form shown in FIG. 2. Slot **18** is provided with bearing edges **24** and **26** which are so positioned, as can be seen in FIG. 4 of the drawings, that surface **31** also forms an obtuse angle to a plane which includes one of the bearing edges such as edge **24** and includes or intersects the other bearing edge such as bearing edge **26**. Stop **32** limits the amount of insertion of web end **16**. Although this stop **32** is not absolutely necessary for the invention, it is preferred. Stops **132** and **232** are equivalent constructions to stop **32**.

When the motor of the device is started, spool **10** rotates in the direction of arrow F pulling the web **12** and holding it on the bearing corners **24** and **26** and bearing edge surface **31**. This effectively holds the web **12** in place on the spool **10** while it is substantially tangent to the circumference of the spool **10**. After the web **12** has been run for the desired length, it may be reversed by rewinding it against the tension of the spring motor connected to spool **10**, until the entire web **12** is reeled off the spool **10**. This brings entrance **25** of the slot **18** of spool **10** back to first, starting or pullout position.

The end **16** of the web **12** will be effectively held within the bearing points **24**, **26** and **31** until slot **18** moves back to starting, or pullout position, at which point the end **16** will slip out. The term "starting position" is synonymous

with the term "pullout position" since the device should be started for each re-use at the point where the web pulls out; otherwise, the spring motor will not be sufficiently wound to be able to reel out the next web completely. This starting or pullout point is where the web achieves substantial perpendicularity to the circumference of the spool **10** as shown in FIG. 2 of the drawings. This pullout position will depend on the stiffness of the paper used in the web **12**. For example, with a web of relatively stiff material, the pullout position will be fairly close to that as shown in FIG. 2 of the drawings whereas with relatively thin web material, the pullout position will be closer to that as shown in FIG. 1 of the drawings.

In this starting position, as stated above, the gripping action of bearing means **24** is lessened, permitting end **16** of web **12** to be withdrawn from slot **18** because the total friction of the three bearing means **24**, **26** and **31** has lessened sufficiently to release the web end **16**. Thus, spool **10** has been reversed an equal number of turns to those made while running forward.

The end **16** of web **12** may be reinforced or provided with thickening or stiffening means such as binding or masking tape **34** as shown in FIG. 7. A preferred edge or end reinforcement of tape, such as masking or adhesive tape **34**, would cover the end **16** of the web **12** from the extreme end to a position where the masking tape **34** would lie a relatively short distance outside of the entrance **25** of slot **18** so as to overlie bearing point **24** as well as wall **22**. In other words, the reinforcing material or substance is long enough, in the direction of movement of the web, to reach from the end of the web to engage all of the bearings.

In another form as shown in FIG. 8 of the drawings, the end **16** of the web **12** is stiffened by dipping it in or by impregnating it with chemical means **35** such as varnish or plastic or any equivalent substance. The invention is complete with the provision of the slotted means **18** as described herein which will work perfectly well without reinforcing the end **16** of web **12**. The reinforcement for the end of the web is not necessary, and is only described as an alternate form of invention to provide for better wearing quality for a web used over and over again.

While I have described my invention in its preferred form, there are other forms which it may take without departing from the spirit and scope of the invention. For example, I have used various terms herein in describing features of my invention such as the term "corner" to describe a bearing means. This term should include an edge or any equivalent construction providing an equivalent bearing means. As another example, I have used the term "plane." This, of course, would also include any radii coming within the said plane, and another example is the use of the term "cutout" or "cutout portion." Such a term is usually used with reference to metallic parts. An equivalent construction made of plastic would be molded to provide an opening or open portion, and it is intended that cutout would include any equivalent construction, whether in metal, plastic or any other material, and I, therefore, desire to be protected for all forms coming within the claims hereinbelow.

Wherefore I claim:

1. A spool, adapted for use as a take-up device for a web: comprising an outer substantially cylindrical surface around a longitudinal axis with at least one longitudinal slot in said surface comprising a pair of facing walls disposed inwardly from said surface, at least one substantially sharp bearing edge formed at the corner of the first of said walls and the surface of the cylinder, at least one other substantially sharp bearing edge formed on the second of said walls substantially parallel to said first mentioned bearing edge and at a smaller radius from said axis than said first mentioned bearing edge, said second mentioned bearing edge being displaced from a plane which includes said first mentioned bearing edge and said axis of said spool, and bearing means contiguous with said first wall substantially in a plane at an obtuse angle to the plane of said first wall and cutting through the plane in which said first mentioned edge and said axis lie.

2. The spool as defined in claim **1** in combination with a web, with a portion of said web bearing on said first bearing edge and a portion of said web bearing on said second bearing edge and a portion of said web bearing against said bearing means.

3. The spool as defined in claim **2** which includes a web stop on said bearing means.

References Cited by the Examiner

UNITED STATES PATENTS

934,744	9/1909	Mitchem.	
1,446,929	2/1923	Rivetta	242—74
2,652,918	9/1953	Lippert	242—74 X
2,704,641	3/1955	Schnetzer et al.	242—74
2,766,948	10/1956	Mundt et al.	242—74.1

FOREIGN PATENTS

1,084,674	7/1960	Germany.
172,399	12/1921	Great Britain.

FRANK J. COHEN, *Primary Examiner.*

MERVIN STEIN, *Examiner.*

N. L. MINTZ, *Assistant Examiner.*