Feb. 13, 1934. T. M. BUTLER 1,947,034

DOUBLE RIBBON MECHANISM

Filed Feb. 26, 1931 2 Sheets-Sheet 1

Fig. 1.

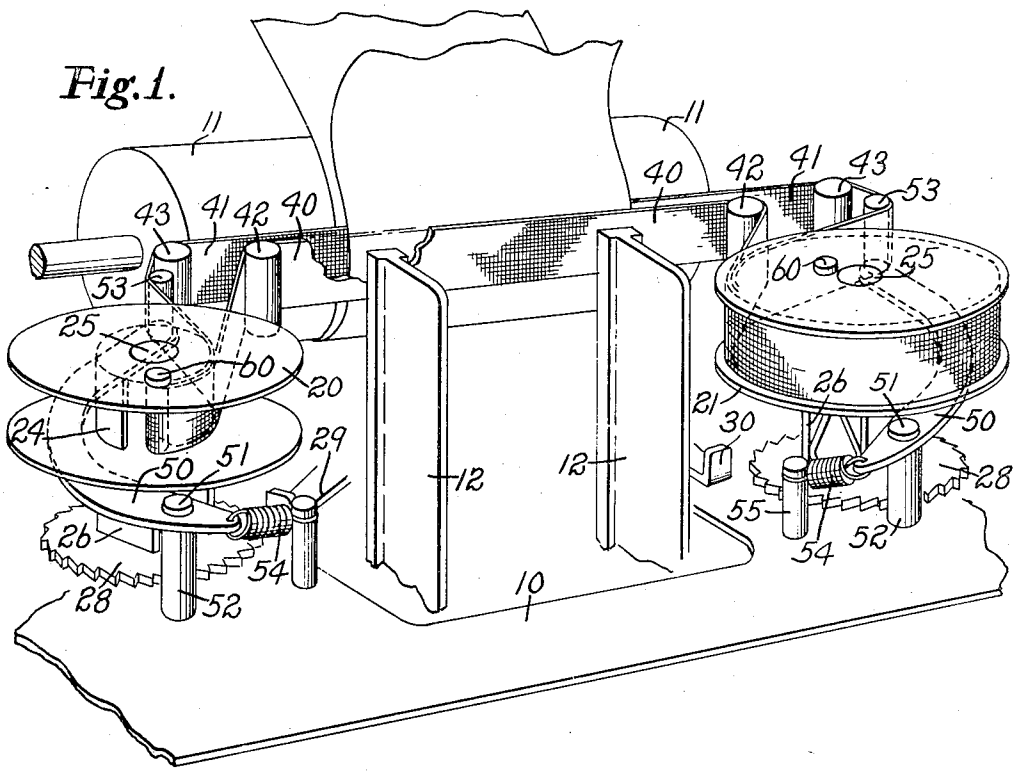


Fig. 2.

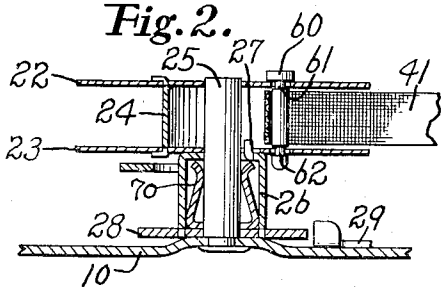
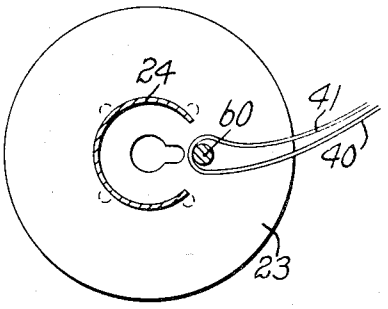


Fig. 3.



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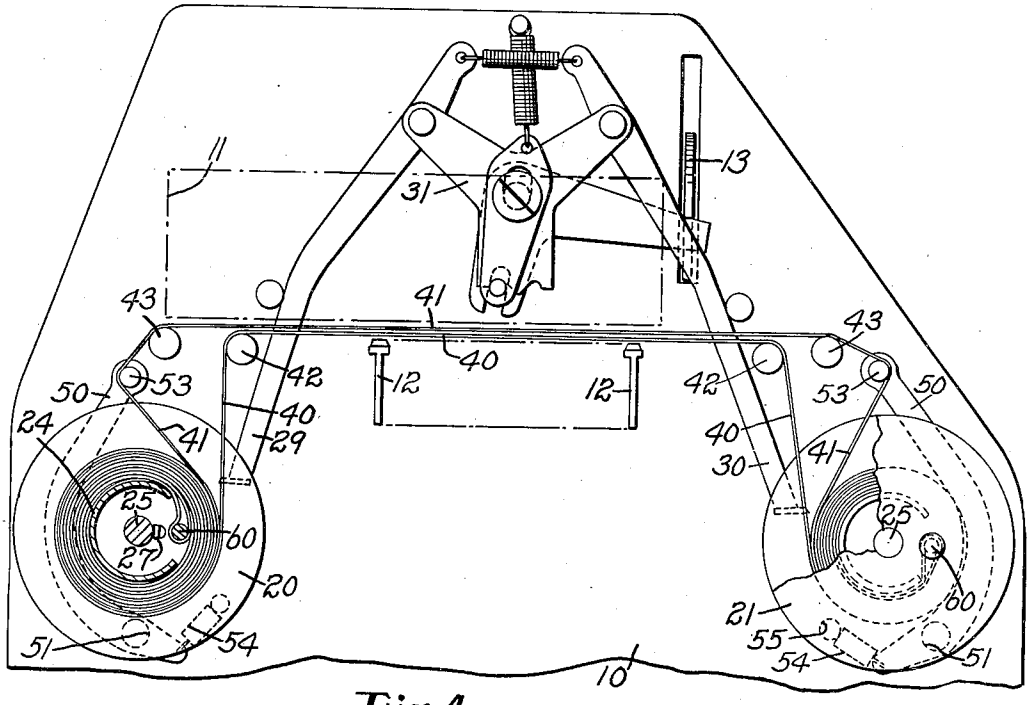


Fig. 4.

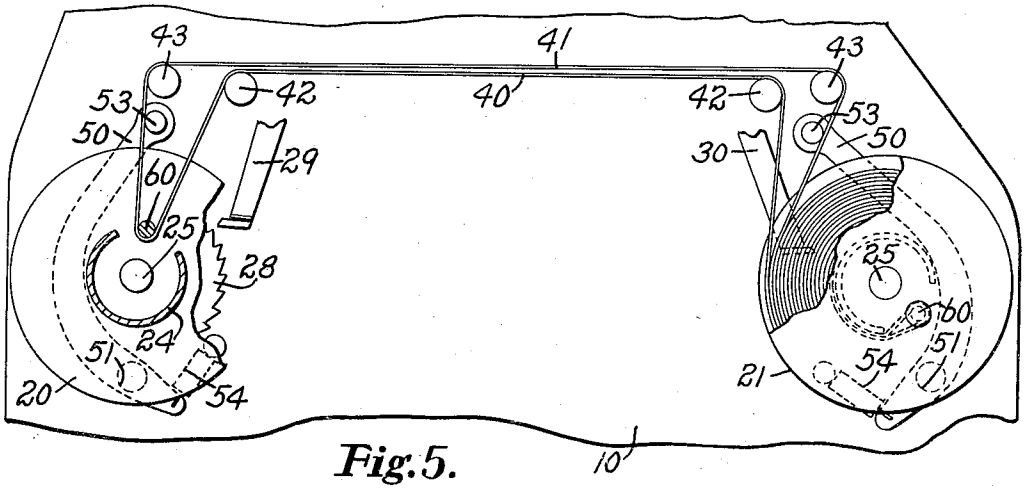


Fig. 5.

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DOUBLE RIBBON MECHANISM

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Application February 26, 1931. Serial No. 518,412

11 Claims. (Cl. 197—153)

This invention relates to a double ribbon mechanism for use on calculating machines, typewriters and the like, to make a plurality of copies of the type bar impressions without the use of carbon paper.

Double ribbon mechanisms have been proposed in which two distinct ribbons are used with a pair of ribbon reels for each ribbon. These devices require a duplication of reels and of feeding devices for the reels, as well as duplication of guides for the ribbons to get them to the printing line. They occupy considerable space and, on the whole, are expensive, cumbersome and unsatisfactory.

A single ribbon which is doubled back on itself has also been proposed. Both ribbon reels are mounted on one side of the machine. The ribbon is led from one reel, passed along the printing line, doubled back around a circular post, and passed back along the printing line to the other reel. This puts all of the ribbon mechanism on one side of the machine and unbalances the machine in weight as well as in appearance. This type has never proven entirely satisfactory.

The present invention avoids the disadvantages of both the above constructions while retaining the advantageous features of each. Only one pair of reels is used which avoids duplication of winding and feeding mechanisms. The reels are mounted on opposite sides of the machine, thus giving a balanced construction. The ribbons are not doubled back but wound from one reel to the other. The two webs of ribbon are wound in superimposed relation on the two reels and, while this may have been attempted in a rough way, the construction has not, as far as known, been successful because of the difficulty of installing the ribbons and because of the difficulty of getting the webs to feed evenly. The webs creep and stretch so that one becomes slack while the other is taut. In fact, when one web is wound on top of the other, the outer or top web travels faster than the inner or lower web with the result that the top web tends to become taut while the under one tends to become slack. The present invention has been devised to overcome these difficulties.

The general object of the present invention is to provide an improved double ribbon mechanism.

A more particular object is to provide a double ribbon mechanism in which two webs of ribbon are wound from one spool on one side of a machine to another spool on the other side of the machine and reversed, and automatic means is provided for maintaining the webs at proper tension at all times.

A further object is to provide a device of this kind with a means for automatically equalizing the tension on the unwound lengths of ribbon web when the webs are unwound from one reel so that, when the web starts to rewind on the empty reel, it will start in such a manner as to have both webs equally tensioned.

Other and more specific objects of the invention will appear from the following specification and drawings.

An embodiment of the invention is shown in the accompanying drawings in which;

Figure 1 is a perspective view of the double ribbon mechanism applied to a calculating machine.

Fig. 2 is a sectional elevation of one of the ribbon reels showing how the ribbon is attached to it.

Fig. 3 is a sectional plan view of one of the ribbon reels showing how the ribbon is attached thereto.

Fig. 4 is a plan view of the double ribbon mechanism showing the position of the parts when an equal amount of ribbon web is on each reel.

Fig. 5 is a view similar to Fig. 4 showing the position of the parts when the webs have been completely unwound from one reel and are about to be rewound on the other reel.

The invention is shown applied to a calculating machine of the type known as the Burroughs Portable, only a portion of which is shown.

Referring to Figs. 1 and 2, the machine has a top plate 10, a platen 11, and a group of type bars 12 of which two are shown. In Fig. 4 there is also shown one of the moving parts 13 of the machine, said part oscillating at each operation, and its movement being employed to operate the ribbon feeding and reverse mechanism hereinafter mentioned.

The two ribbon reels 20 and 21 are mounted on opposite sides of the group of type bars 12 which gives a balanced construction occupying a minimum amount of space. The two reels are constructed and mounted alike and only one of them will be described.

Referring to Figs. 2 and 3 the reel comprises two end plates 22 and 23 joined by a cylindrical center portion forming a drum 24 on which the ribbon is wound, the end plates serving as guides. The reel is rotatably mounted on a supporting post 25 with the lower side of the reel resting upon a box-like support 26 having a projection 27 that extends into an opening in the reel to

drive it. The box 26 is attached to a ratchet wheel 28 which is driven by means of the pawl 29.

The ribbon feeding and reverse mechanism is shown in Fig. 4. There are two pawls 29 and 30 one for each of the ribbon reels. When one of of the pawls is active the other is idle. The pawls are operated by the oscillation of a member 31 that is driven by the machine part 13. The construction is such that, when the ribbon has been wound from one reel to the other, the tension produced on the ribbon by the continued effort of the feeding mechanism to move it, causes the feeding mechanism to automatically reverse and wind the ribbon in the opposite direction to which it has been moving. An understanding of the details of this mechanism is not necessary for an understanding of the present invention, reference being made to Patent No. 1,690,487 where the mechanism is fully described.

The two webs of ribbon 40 and 41 are mounted upon the two reels and wound in superimposed relation. These two webs are guided past the printing line of the machine by means of guide posts 42 and 43, there being a pair of guide posts adjacent each reel. These guide posts space the webs slightly and hold them in position relative to the platen. It is to be understood, of course, that when the webs are in this position, as shown for example in Figure 1, the first paper on which a copy is desired is passed between the two ribbons and the second paper is placed behind the ribbon 41.

One difficulty with a device of this kind is the matter of keeping both webs under the proper tension. Proper printing impressions are not made unless the ribbons are held with sufficient tension to prevent them from wrinkling or from being so loose as to smear the paper. When the two webs are wound in superimposed relation as shown, the outer web 40 travels faster than the inner because it travels around the reels on a slightly larger circumference than the inner web. The result is that the outer web is drawn taut while the inner web acquires quite a bit of slack as the webs wind from one spool to the other. The tension and slack of the respective webs varies during the winding from one reel to the other and one of the factors affecting it may be explained as follows:

Assume that the webs are in the condition illustrated in Fig. 1 where they are just starting to wind on the reel 20. The circumference about which the webs are being wound on the reel 20 is small relative to the circumference from which the webs are being unwound from reel 21. As is well known, the circumference of a circle varies in proportion to its radius. The radius of the drum of the reel 20 in Fig. 1 is relatively small and it follows that, with such a small radius, the difference in the circumference about which the inner web is wound relative to the circumference about which the outer web is wound will be quite marked. In other words, relatively speaking, the thickness of the inner web makes an appreciable difference in the length of the circumference of the outer web. However, where the radius is large, as in the condition of the reel 21 in Fig. 1, the slight difference caused by the thickness of the inner web does not have such a relatively great effect on the circumference about which the outer web is being unwound. Accordingly, the outside web tends to wind considerably faster on the reel 20 than does the inside web and this difference is greater than the difference between the rate at which these two webs unwind from the large circumference of reel 21. The result is that the outside web becomes tensioned and a slack is created in the inner web.

When the webs reach the condition of Fig. 4, there is approximately the same amount of ribbon on each reel and the two webs are wound on the reel 20 at approximately the same rate as they are unwound from the reel 21 because the radii of the circumferences of the ribbon webs are about equal.

As the roll of ribbon on reel 20 becomes larger and the roll on reel 21 smaller, the reverse action takes place, that is, the outside ribbon web 40 tends to unwind faster from reel 21 than the inner web 41 and the difference in rate of unwinding between these webs is greater than the difference of winding on the reel 20 so that the outside web tends to slack away and the previous slack in the inner web tends to be taken up.

In order to overcome the above difficulties means has been provided for automatically taking up the slack in the inner web 41. A device is provided adjacent each of the reels for taking up the slack of the ribbon near said reel. For convenience, these devices will be called equalizers. Each equalizer comprises a curved arm 50 pivoted at 51 to a stud 52 supported by the plate 10. The free end of arm 50 carries a cylindrical stud 53 positioned inside the ribbon web 41 as shown in Fig. 1. The arm 50 of the right hand equalizer in Fig. 1 is urged clockwise by a spring 54 connected at one end to the arm 50 and at its other end to a stud 55 on plate 10. The tension exerted by the spring is just sufficient to take up any slack that may occur in the ribbon web 41.

The left hand equalizer in Fig. 1 operates in exactly the same way as the right hand one, the arm 50 being urged counter-clockwise by its spring 54.

As will be observed from Figs. 1 and 4, the right and left equalizers operate against each other to keep the ribbon web 41 stretched across the printing line.

In practice it has been found that when the webs start winding on an empty reel, as on the reel 20 in Fig. 1, the arms 50 with their studs 53 gradually move outward to take up slack in the web 41. This continues until the webs reach the condition of Fig. 4 when such outward movement ceases. For the remainder of the winding operation the arms move inward gradually, indicating that the slack in the inner web 41 is being taken up automatically by the winding. Theoretically, the slack that occurs during the winding of the first half of the webs should be automatically taken up during the winding of the latter half but, in practice, this does not always occur due to stretching of the ribbon, pounding of the type against the ribbon, and other causes inherent in the use of fabric. Even if it did occur the two webs would not operate properly without the equalizers because, during a very considerable portion of the operation, one of the webs would be very loose. To avoid this the automatic equalizers herein disclosed have been provided.

The above described construction serves to take up the slack in the inner web 41 under the conditions mentioned but there has been combined with it another novel feature for insuring that the two webs will be wound properly from one spool to the other.

As previously explained, the webs may stretch

differently and there is a tendency for one to creep relative to the other. In some cases there might be so much slack accumulate in the inner web 41 that the automatic equalizers could not move far enough to take it up. This would tend to become cumulative. In order to avoid this possibility the following novel construction has been provided.

The ribbon is made in the form of an endless web, that is, it is a single ribbon in the form of a loop. The ends of this loop are attached to the reels by attaching devices around which the loop may move. In the embodiment shown, these attaching devices comprise pins 60 (Fig. 2) removably mounted in openings in the reels. The pins have upper and lower grooves 61 and 62 in them so that when there is a pull on the ribbon the edges of the openings in the end plates 22 and 23 of the ribbon reel enters the grooves in the pins and prevents the pins from coming out. These removable pins are positioned inside the loop of ribbon as shown clearly in Figs. 2 and 3. The pins are positioned relative to the drum 24 so that, when the reel is rotated, the two webs of the loop will begin winding on the drum. The operation and the advantages of this construction are as follows:

Assume that the ribbon is being wound from the reel 20 to the reel 21 in Fig. 1 but that the reversing mechanism has not yet operated. Assume also that when the end of the ribbon is reached on reel 20 there is considerable slack in the inner web 41, which, however, is being held out or taken up by the automatic equalizer 50—53. As further tension is placed on the two webs of the ribbon by the feeding mechanism, it will be apparent that the ribbon loop will slide around the pin 60 or the pin will turn so that the two webs will adjust themselves to an equal tension or, looking at it in another way, the two unwound ends of the ribbon will slip around the cylindrical pin 60 so that the tension in one will take up the slack in the other. Accordingly, when the ribbon reverse mechanism operates and the ribbon starts to rewind on the reel 20, the two webs will be of equal tension and will start to wind in the proper way.

The automatic ribbon reverse is not operated until the tension on the ribbon has become sufficient to cause said mechanism to reverse. This means that a very considerable tension would be placed on the outer web and, since the ribbon loop can slip around the pin 60, this tension would be transmitted to the inner web with the result that before the ribbon mechanism would operate both the outer and inner webs would be quite taut and in the condition of Fig. 5 where it will be observed that both webs of the ribbon extend straight from their guide pins 42 and 43 to the reels, the equalizers 50—53 being pulled in against the tension of their springs. When the feeding mechanism is reversed this tension is slightly relieved and the next operation of the feeding mechanism tends to wind the webs on the reel 20. It might be thought that, when the tension is released, the equalizers would move out immediately to the extreme limit, but such is not the case because, in the first place, the springs 54 are not very strong and, in the second place, there is enough friction between the brake springs 70 (Fig. 2) between the reels and the post 25 that this result does not occur.

It is to be understood that the construction shown is for purpose of illustration only and that variations may be made in it without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. In a machine of the class described, a pair of ribbon reels, a plurality of ribbon webs extending from one reel to the other, means for winding the webs from one reel to the other and vice versa, means guiding said webs past the printing line of the machine while they are being wound from one reel to the other, means automatically taking up the slack on one of the webs while they are being wound from one reel to the other, and means capable of overcoming said slack-taking means acting to automatically equalize the tension of the unwound lengths of said webs as said webs are completely unwound from either reel.

2. In a machine of the class described, a pair of ribbon reels, a plurality of ribbon webs extending from one reel to the other, means for winding said webs from one reel to the other and vice versa, guides for guiding said webs adjacent the printing line of the machine while they are being wound from one reel to the other, and attaching means for attaching said webs to said reels so that the pull of said winding means on said webs automatically equalizes the tension of the unwound lengths of said webs as they are completely unwound from either spool.

3. In a machine of the class described, a pair of ribbon reels, a plurality of ribbon webs extending from one reel to the other, means for winding said webs from one reel to the other and vice versa, guides for guiding said webs adjacent the printing line of the machine while they are being wound from one reel to the other, and means automatically equalizing the tension of the unwound lengths of said webs when said webs are completely unwound from either reel.

4. In a machine of the class described, a pair of ribbon reels, a pair of ribbon webs extending between said reels, means for winding said webs from one reel to another including an automatic reversing mechanism for reversing the direction of the winding when the webs are exhausted from one reel, and means automatically equalizing the tension on said webs at the time the direction of winding is reversed.

5. In a machine of the class described, a pair of ribbon reels, an endless ribbon on said reels, said ribbon being in the form of a loop with the two webs of the loop extending between said reels, and an attaching device on each reel positioned inside the ribbon loop whereby, when the ribbon is unwound from a reel, the loop automatically adjusts itself about said attaching device to equalize the tension on the two webs of the ribbon.

6. In a machine of the class described, a pair of ribbon reels, a ribbon on said reels in the form of an endless loop with the two webs of the loop extending between said reels, and a removable pin on each reel positioned inside the loop whereby, when the ribbon is unwound from a reel, it automatically adjusts itself around said pin to equalize the tension on the two webs of said ribbon.

7. In a machine of the class described, a pair of ribbon reels, an endless ribbon on said reels, said ribbon being in the form of a loop with two webs of ribbon extending between said reels, feeding means for winding the ribbon from one reel to the other, said feeding means including an automatic reversing device for reversing the direction of feed when the ribbon is exhausted from one reel, and an attaching device on each

reel allowing the ribbon loop to move freely about it whereby, when the ribbon is tensioned by the feeding means at the time said ribbon is exhausted from one spool, the loop adjusts itself about said attaching device to equalize the tension on the two webs of the loop.

8. In a machine of the class described, a pair of ribbon reels, an endless ribbon on said reels, said ribbon being in the form of a loop with two webs extending between said reels, a ribbon attaching device on each reel positioned inside the ribbon loop whereby, when the ribbon is unwound from a reel, the loop automatically slips around said attaching device to equalize the tension on the two webs of ribbon, and an automatic equalizing means for taking up the slack in one of said webs while the webs are being wound from one reel to the other.

9. In a machine of the class described, a pair of ribbon reels, a plurality of ribbon webs extending from one reel to the other, means for winding said webs from one reel to the other and vice versa, guides for guiding said webs adjacent the printing line of the machine, while they are being wound from one reel to the other, and means automatically equalizing the unwound lengths of webs as the winding of said webs from one reel to the other is completed.

10. In a machine of the class described, a pair of ribbon reels, a plurality of ribbon webs extending from one reel to the other, means for winding said webs from one reel to the other and vice versa, guides for guiding said webs past the printing line of the machine as they are being wound from one reel to the other, and means for attaching said webs to said reels so that the pull of said winding means on said webs acts to automatically equalize the unwound lengths of said webs as the winding of said webs from one reel to the other is completed.

11. In a duplicating machine having a plurality of pairs of ribbon guides, a pair of ribbon spools and a ribbon, the ends whereof are attached to one spool and the loops carried through said respective pairs of guides with the bight of said ribbon being slidably secured to the other of said ribbon spools.

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