

Feb. 11, 1969

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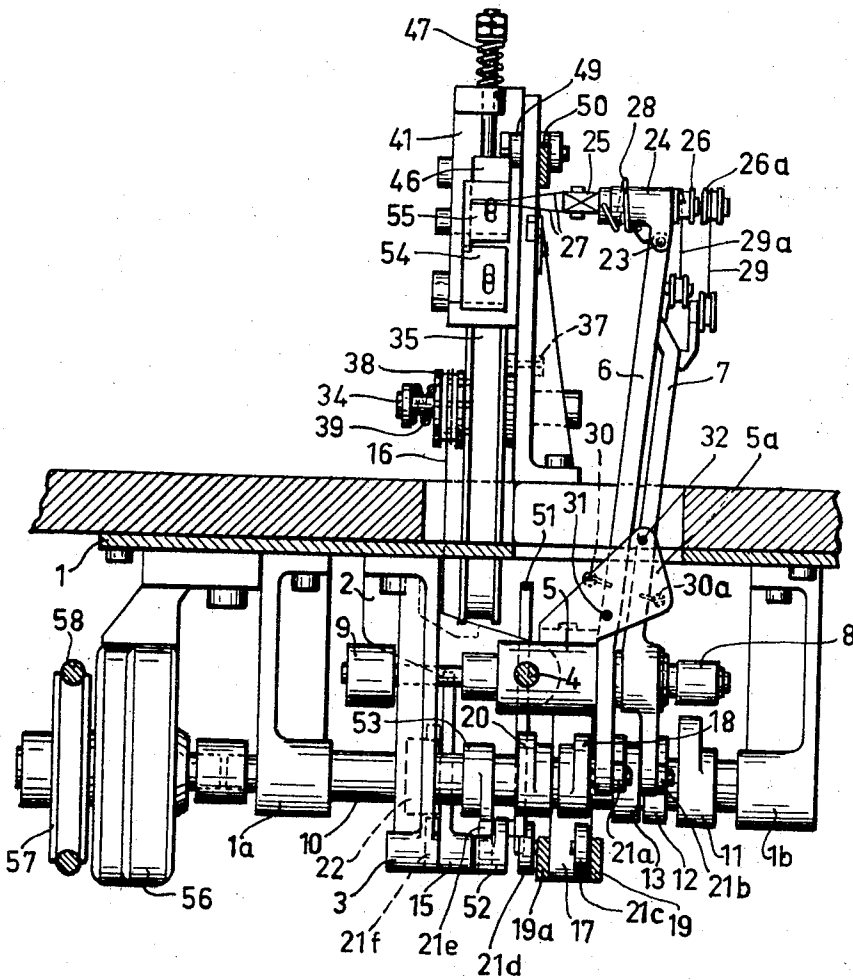
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APPARATUS FOR AUTOMATIC MANUFACTURING OF AN ANNULAR RIBBON

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FIG.1



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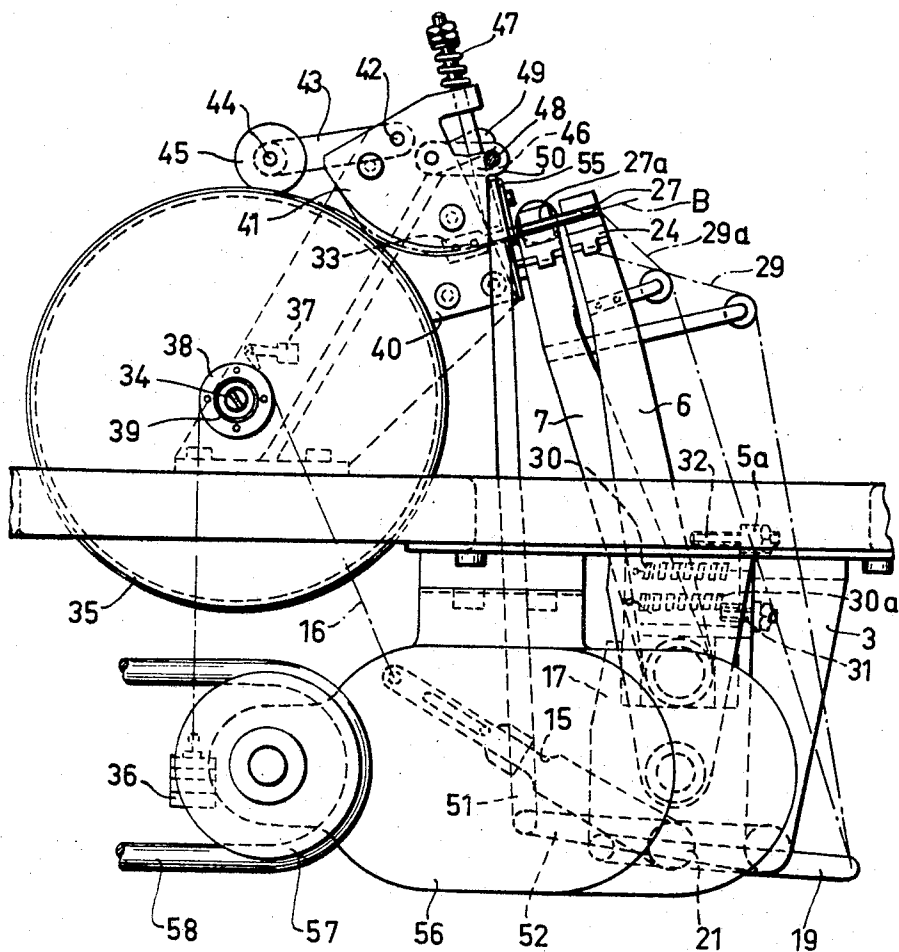
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FIG. 2



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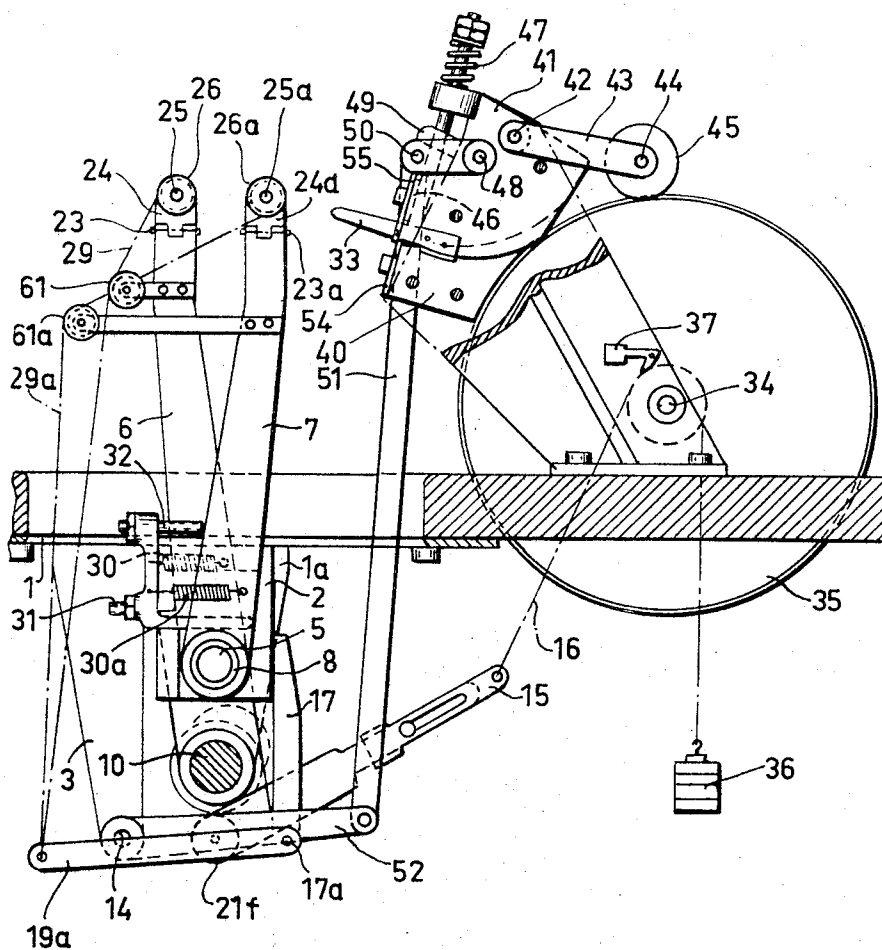
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FIG. 3



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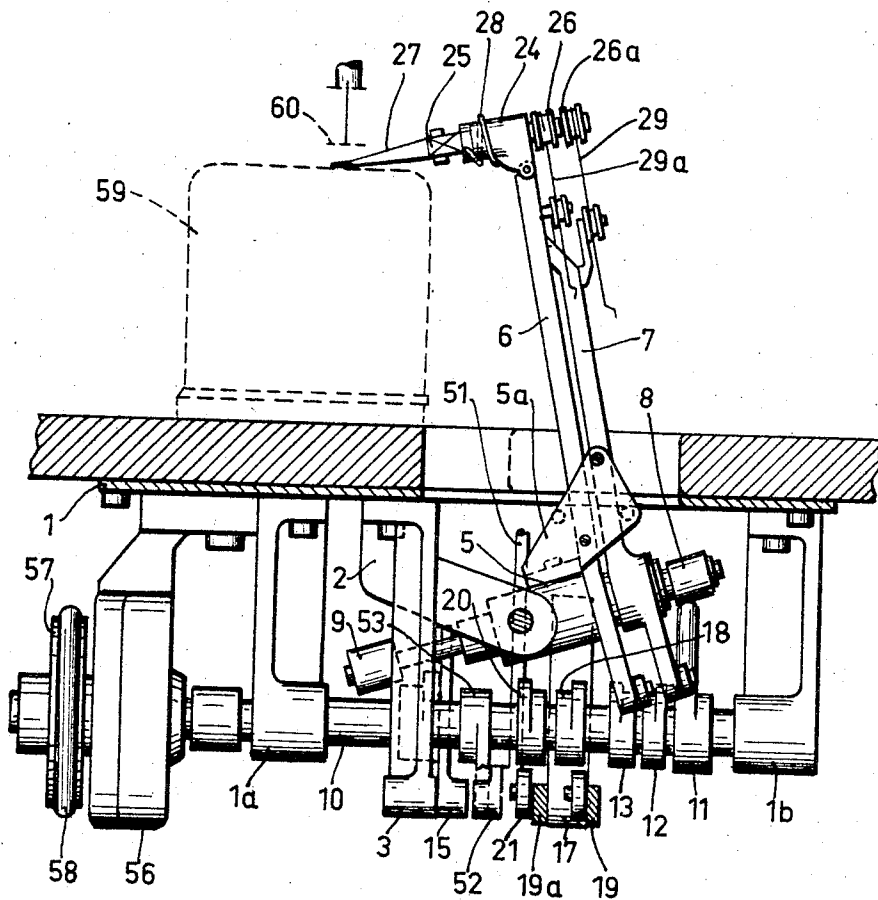
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FIG. 4



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APPARATUS FOR AUTOMATIC MANUFACTURING OF AN ANNULAR RIBBON

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13 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus for forming a closed annular loop from a ribbon, preferably of elastic material, fed from a roll; wherein, the ribbon is fed from the roll by rotating the roll for a predetermined period of time; simultaneously with the feeding of the ribbon a first free end of the ribbon is gripped adjacent the end but leaving a portion extending beyond the gripper, this first gripper is then turned 180° to reverse the free end of the ribbon, thereafter, toward the end of the feeding period, the ribbon is cut from the roll and gripped adjacent the cut end, while again leaving a free end extending beyond the second gripper, and the second gripper is rotated to turn the second free end 180° to overlap the first-mentioned end; and, finally, the grippers carrying the overlapped free ends of the ribbon between them are rocked to position the overlapped end under a mechanism for joining the ends of the ribbon, such as the presser foot of a sewing machine. The sequence of timed operations is carried out, preferably, by a plurality of cams mounted on a rotatable shaft and mechanically coupled to the respective operating elements.

This invention relates to an arrangement or apparatus for automatically manufacturing an annular ribbon, preferably an elastic ribbon, wherein the ribbon is advanced from stock, for example from a roll.

The apparatus adjust automatically the ribbons which are required for an elastic ring of a certain size, units the ribbon to a ring and thereafter introduces the ring into a sewing machine for being sewn together, or into another joining arrangement.

The apparatus is substantially characterized in that it comprises a first grip member for gripping the free end of the ribbon advanced, an adjustable feeding device for feeding a length determined for the size of the annular ribbon for every setting, a second grip member for gripping the ribbon at the end of the ribbon length advanced, a cutting device for cutting off the ribbon at the last-mentioned ribbon end, guide means for guiding the ribbon after its cutting with its ends placed overlapping one another to an arrangement for joining the said overlapping ribbon ends, and drive means for positively operating in a certain time sequence the grip members, the feeding device, the cutting device and the guide means.

The invention is described in the following to a greater detail, reference being had to the accompanying drawings which show an embodiment of the same.

FIG. 1 shows a lateral view of an apparatus according to the invention,

FIG. 2 shows a view seen from the left-hand side in FIG. 1 and intended to show a starting position for the apparatus before the ribbon is fed into the same,

FIG. 3 shows a view seen from the right-hand side in FIG. 1 and primarily intended to show the guide means for the feeding device, cutting device and grip members comprised in the apparatus, certain parts, however, being omitted for better clarity,

FIG. 4 shows in a view corresponding to FIG. 1 the

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apparatus connected to a sewing machine, also here certain parts being omitted.

As appears from FIG. 4, the apparatus shown is arranged in the embodiment at a sewing machine which is indicated by dashed lines in FIG. 4 and has the reference numeral 59, the press foot having the reference numeral 60.

The apparatus comprises a plate 1 secured by screwing to the lower surface of the sewing machine table. On the plate 1 are secured by screwing two bearing supports 1a and 1b for a drive shaft 10, and further an angular support 2 and an arm 3. The angular support 2 carries an axle journal 4 about which is pivoted a two-armed shaft 5 which at one free end carries a weight 9 and at its other free end is provided with a cam roll 8. Between the cam roll 8 and the axle journal 4 two rocker arms 6 and 7 are rockingly mounted on the shaft 5. The rocking arms support at their lower free end cam rolls 21a and 21b respectively and are at their upper ends provided with tweezers-like grip members 27 and 27a respectively for the ribbon. On the drive shaft 10 which is driven via a belt 58 from the sewing machine motor, a pulley 57 and a gear 56, eccentrics 11, 12 and 13 are mounted for cooperation with the cam rolls 8, 21b and 21e respectively. For a reason explained below the drive shaft 10 is provided also with additional eccentrics 18, 20, 22 and 53.

At the free end of the arm 3 is mounted an axle journal 14 about which is pivotable an angular arm 15 which can be adjusted in the longitudinal direction. At the free end of the angular arm 15 is mounted a steel rope 16 wound a desired number of turns about a rope wheel 38 and carrying at its free end a weight 36. At the arm 15 is mounted a cam roll 21f for cooperation with the eccentric 22 on the drive shaft 10. On the axle journal 14 further is mounted an arm 52 which via a link is connected with an arm 51 having the function described below in a greater detail. At the arm 52 is mounted a cam roll 21e for cooperation with the eccentric 53 on the drive shaft 10.

An arm 17 is secured at the angular support 2 and at its free end provided with a shaft 17a on which are mounted two arms 19 and 19a. At said arms 19, 19a are arranged two cam rolls 21c and 21d respectively for cooperation with the eccentrics 18 and 20 respectively on the drive shaft 10.

The aforesaid tweezers-like grip members 27 and 27a are secured at axle journals 25 and 25a respectively which in their turn are pivoted in sleeves 24 and 24a respectively and hereby actuated by springs 28 and 28a respectively. The said sleeves are articulated at the rocking arms 6 and 7 respectively by shafts 23 and 23a respectively. On that side of the sleeves 24 and 24a respectively which is located opposite to the grip members 27 and 27a respectively, rope pulleys 26 and 26a respectively are mounted on the shaft 25 and 25a respectively. Ropes 29 and 29a respectively are secured at one end of the rope pulleys 26 and 26a respectively, drawn over guide disks 61 and 61a respectively and at their other end secured at the arms 19 and 19a respectively.

On the upper surface of the sewing machine table is secured by screwing a support carrying a shaft 34 on which is mounted a feed wheel 35 for the ribbon. The shaft 34 further is provided with the rope wheel 38 for the rope 16 and a spring 39 which presses pawls on the rope wheel 38 against teeth in the feed wheel 35. A pawl 37 is mounted for locking the feed wheel 35 in advanced position. The said support also carries a device for opening the tweezers blades and a device for cutting the ribbon.

The device for opening the tweezers blades so that a ribbon can be inserted between the same, comprises a

wedge-shaped arm 33 mounted at the support, which arm upon the swinging of the rocking arms against the same penetrates between the blades and presses them part. Upon the swing-back motion of the rocking arms and when the arm 33 is disengaged from the tweezers blades, said blades again are pressed against each other and against a ribbon inserted between the blades.

The device for cutting the ribbon comprises a knife mounting 40 secured at the support, at which mounting is attached adjustably a knife 54. On said knife mounting 40 is fastened a holder 41 and a guide 46 provided with an adjustable knife 55 mounted in said holder. The device also comprises a rod mounted at the guide and a spring 47 about said rod. The spring 47 normally maintains the guide 46 with its knife 55 spaced from the knife 54. At the support is further mounted a shaft 48, to which is secured an arm 49 which with its free end abuts to the guide between the arm and the spring 47. An arm 50 which also is mounted at the shaft 48 is articulated with the aforesaid arm 51.

At the support on the upper surface of the sewing machine table there is further mounted a shaft 42 to which is secured an arm 43 which at its free end is provided with a shaft 44 for a pressure roll 45. The said roll presses the ribbon against the feed wheel 35 for preventing the ribbon from sliding, especially at its start. The ribbon can be fed to the feed wheel 35 from rolls or from ribbon collected in another way.

The apparatus finally comprises set screws 31 and 32 for adjusting the rocking arms 6 and 7 respectively, so that the grip members 27 and 27a respectively are given their correct position in relation to the sewing machine needle. The set screw 31 is mounted on a spring holder 5a which is secured at the two-armed shaft 5. The set screw 32 is mounted on the rocking arm 6. At the spring holder 5a is attached one end of the tension springs 30 and 30a respectively for the rocking arms 6 and 7 respectively, the other end of said springs being fastened at the rocking arms.

The apparatus operates as follows:

Upon starting the sewing machine motor, the drive shaft 10 rotates by the transfer of motion via the belt 58, the pulley 57 and the gear 56 which is stepped down and in direct connection with the drive shaft 10. The shaft 10 rotates one revolution for every ribbon completely sewn. From the shaft 10 are effected and controlled all functional movements of the apparatus by the aforementioned eccentrics, cam rolls, arms and ropes illustrated on the drawings. The eccentrics are arranged such that a predetermined time sequence between the various functions is obtained. The eccentrics may also be exchangeable so as to vary the period length for the various functions. This applies particularly to the eccentric 22 for varying the ribbon length advanced.

The starting position of the apparatus is shown in FIG. 2. The tweezers blades 27 and 27a are open, i.e. the wedge-shaped arm 33 is placed between the blades. This position was obtained by the rocking arms 6 and 7 respectively which were positively turned against the action of the springs 30 and 30a respectively by the cam rolls 21a and 21b respectively and the eccentrics 13 and 12 respectively.

The eccentrics 18 and 20 are in engagement with the cam rolls 21d and 21c whereby the shafts 25 and 25a respectively was rotated against the action of the springs 28 and 28a respectively into the position shown in FIG. 2 by the downward swinging motion of the arms 19 and 19a respectively and, thereby, by the downward pulling of the ropes 16 and 16a respectively. The eccentric 53, furthermore, is out of engagement with the cam roll 21e so that the arm 49 is lifted up into its upper end position and the knives 54 and 55 are separated. The eccentric 22, finally, is out of engagement with the cam roll 21f, and the arm 15 is in its uppermost end position.

Upon rotation of the drive shaft 10 the eccentric 22

presses the arm 15 downwards whereby the rope 16 rotates the rope wheel 35 for the ribbon B. After a certain ribbon length was fed between the open tweezers blades, for example 20 mm. beyond the grip member 27, the eccentric 13 leaves the engagement with the cam roll 21a whereby the rocking arm 6 with the grip member 27 is turned to the right in FIG. 2. The grip member 27 hereby disengages the wedge-shaped arm 33, and the ribbon is caught by the tweezers blades. During the turning motion of the arm 6 into abutment to the set screw 31 also the eccentric 18 leaves the engagement with the cam roll 21c whereby the shaft 25 and thereby the grip member 27 are rotated half a revolution by the spring 28, so that the ribbon end is directed substantially opposite to the direction of the ribbon advanced through the grip members.

By the continued feed of the ribbon now is formed a loop suspending between the grip member 27 and the grip member 27a, which latter still is in the starting position. When the ribbon length located between the grip members approaches the predetermined length, the arm 7 by cooperation between the eccentric 12 and the cam roll 21b and by the action of the tension spring 30a is turned to a position from the knives 54 and 55 which suitably agrees with the length for the free ribbon end projecting out of the grip member 27. When the ribbon length determined by the eccentric 22 and by the finely adjustable arm 15 has been fed, the eccentric 53 engages with the cam roll 21e so that the knife 55 is pressed downwards and cuts off the ribbon, at the same time as the arm 7 is turned additionally by cooperation of the eccentric 12 so that the grip member 27a disengages the wedge-shaped arm 33 and the ribbon is caught by the tweezers blades whereafter the cam roll 21e disengages the eccentric 53, and the knives are separated. Upon the continued turning motion of the arm 7 to the set screw 32 by the tension spring 30a and while the eccentric 12 leaves the engagement with the cam roll 21b, the spring 28a rotates the shaft 25a and thereby the grip member 27a half a revolution, while at the same time the cam roll 21d is rolled off the eccentric 20, so that the free ribbon ends projecting out of the grip members 27 and 27a are overlapping one another. Hereby the ribbon forms an unjoined ring.

It is to be observed that the ribbon B is fed with a lower speed at the beginning and at the end, in order to enable the rocking arms 6 and 7 to carry out their turning motions for bringing the grip members 27 and 27a into engagement with the ribbon.

All of the cam rolls 21a-f are now out of engagement with the respective eccentrics 12, 13, 18, 20, 53 and 22. Upon the continued rotation of the drive shaft 10 the eccentric 11 strikes against the cam roll 8 and swings the shaft 5 about the journal 4 and thereby the rocking arms 6 and 7 by means of the ribbon ring held together by the grip members 27 and 27a to the position shown in FIG. 4, i.e. the overlapping ribbon ends are located below the press foot 60 of the sewing machine. When the tweezers blades of the grip members meet the sewing machine table, they can follow the table because the sleeves 24 and 24a respectively are linked at the rocking arms 6 and 7 respectively by the shafts 23 and 23a respectively. The eccentric 11 is preferably exchangeable for being adapted to vary the size of the swinging motion of the shaft 5 to adjust to different ribbon widths. When the ribbon is in correct position below the press foot 60, a micro-switch (not shown) sends an impulse to a magnetic lifter (not shown) connected to the starting arm of the sewing machine, and the press foot falls down to lock the ribbon. Thereafter, by rolling the cam roll 8 off the eccentric 11, the grip members are pulled out of engagement with the locked ribbon. The sewing machine starts and joins the overlapping ribbon ends whereafter, finally, in a suitable way by means of a mechanism provided on the sewing machine the ribbon ring after its joining is pushed out and collected.

An example may be mentioned that, depending on the capacity of the sewing machine, 20 to 25 ribbons can be produced per minute.

What I claim is:

1. Apparatus for the automatic manufacture of annular ribbons from such ribbon stored on a supply roll; comprising, drive means for said apparatus; a plurality of actuating means coupled to said drive means and driven thereby for actuating a like number of operating mechanisms for predetermined periods of time and in timed sequence; an adjustable feed means operatively coupled to a first of said actuating means and adapted to feed a predetermined length of ribbon from said roll; a first gripping means operatively coupled to a second of said actuating means and adapted to grip the free end of said ribbon adjacent said free end; cut-off means operatively coupled to a third of said actuating means and adapted to sever the said predetermined length of ribbon from said roll; second gripping means operatively coupled to a fourth of said actuating means and adapted to grip the cut off end of said ribbon adjacent said cut off end; rotating means operatively connected to each of said gripping means, operatively connected to a fifth and a sixth of said actuating means and adapted to rotate the ends of said ribbon to an overlapping position; and guide means operatively connected to a seventh of said actuating means and adapted to move said first and second gripping means to a position adjacent a mechanism for joining said overlapping ends of said ribbon.

2. Apparatus in accordance with claim 1 wherein the drive means includes a single drive shaft and the actuating means are mechanical actuating means coupled to said drive shaft.

3. Apparatus in accordance with the claim 1 wherein a locking element is mounted on the apparatus and is adapted to pass into the first and the second gripping means it hold said gripping means open during the initial feeding of the ribbon so that said gripping means may receive the free end of the ribbon, and the second and the fourth actuating means include guide means for moving said first gripping means and said second gripping means out of engagement with said locking element and into gripping contact with the ribbon in a predetermined time sequence.

4. Apparatus in accordance with claim 1 wherein the gripping means are tweezer-type, spring-loaded gripping means.

5. Apparatus in accordance with claim 2 wherein the second and fourth actuating means include at least one eccentric mounted on the drive shaft, a second shaft mounted on the apparatus parallel with said drive shaft, a pair of arms mounted on the said second shaft intermediate the ends of said arms, one of each of said free arms carries one of the gripping means and the opposite ends of said arms operatively contact said eccentric, whereby said arms are swung about said second shaft.

6. Apparatus in accordance with claim 5 wherein the

gripping means are rotatably mounted in the arms to rotate about their geometric axes upon the swinging of the arms.

7. Apparatus in accordance with claim 5 wherein a third shaft is mounted on the apparatus, the second shaft is pivotally mounted on said third shaft perpendicular thereto, and an eccentric forms a part of the seventh actuating means in operative contact with said third shaft whereby the gripping means, holding a cut off and overlapped section of ribbon, are guided to the joining mechanism.

8. Apparatus in accordance with claim 2 wherein the feed means includes a feed and a pressure wheel cooperating therewith between which the ribbon is advanced upon driving of the feeding wheel, the first actuating means includes an eccentric mounted on the drive shaft, a second shaft mounted in parallel with the drive shaft, an arm mounted on the second shaft and adapted to swing about said second shaft upon contact with said eccentric and a rope connected to said arm and to said feed wheel to drive said feed wheel.

9. Apparatus in accordance with claim 8 wherein the eccentric is variable in size in order to vary the length of the arc described by the swinging arm and to thereby advance different lengths of ribbon.

10. Apparatus in accordance with claim 8 wherein the arm is adjustable in length to provide a fine adjustment in the length of ribbon advanced.

11. Apparatus in accordance with claim 2 wherein the fourth actuating means includes an eccentric mounted on the drive shaft and a link means connecting the cutting means to said eccentric.

12. Apparatus in accordance with claim 11 wherein the cutting means includes a stationary element and a movable element and said movable element is connected to the link means.

13. Apparatus in accordance with claim 1 wherein the actuating means associated with the gripping means, the feeding means, the cutting means, and the guide means include return means adapted to return each element to position of rest, following each positive movement of the element.

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U.S. Cl. X.R.

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