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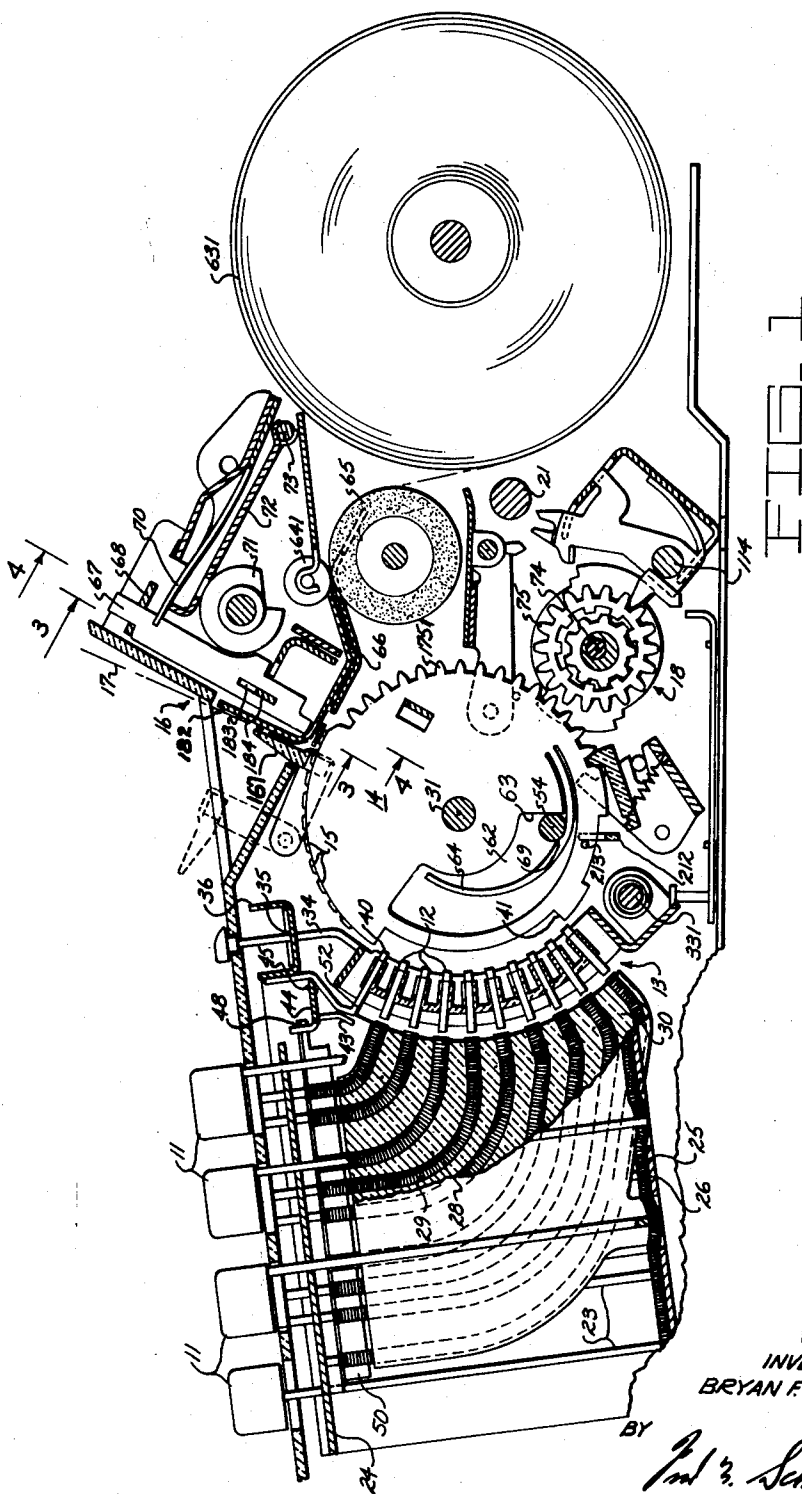
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3,146,708

PRINTING RIBBON MECHANISM

Filed Sept. 25, 1961

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

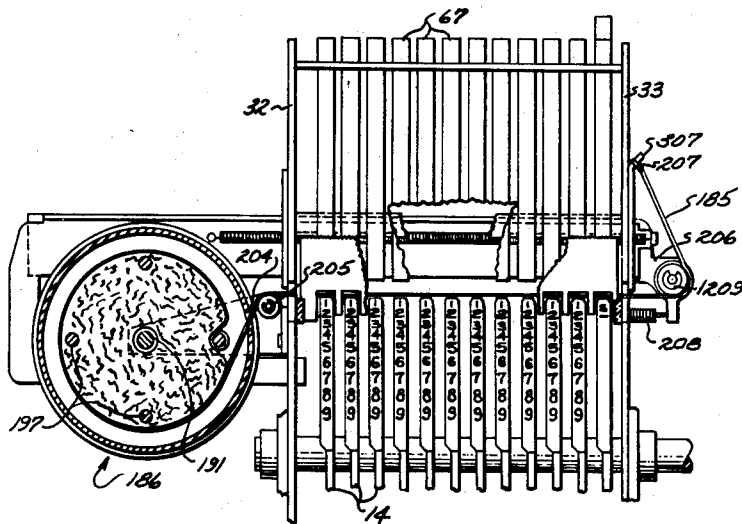
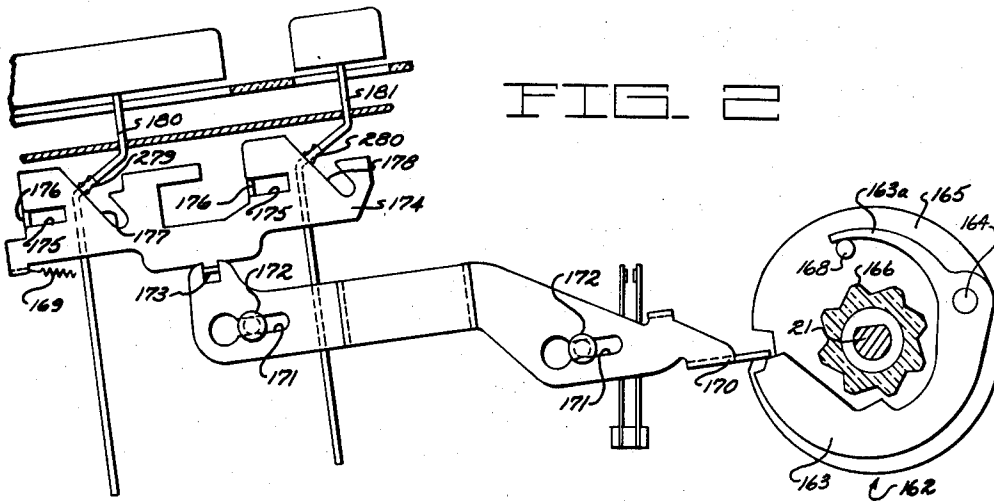


FIG. 3

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3 Sheets-Sheet 3

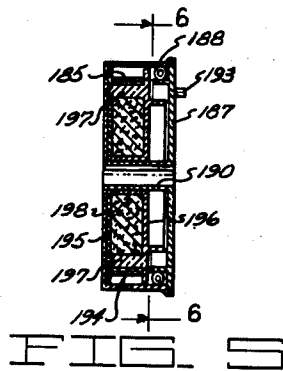
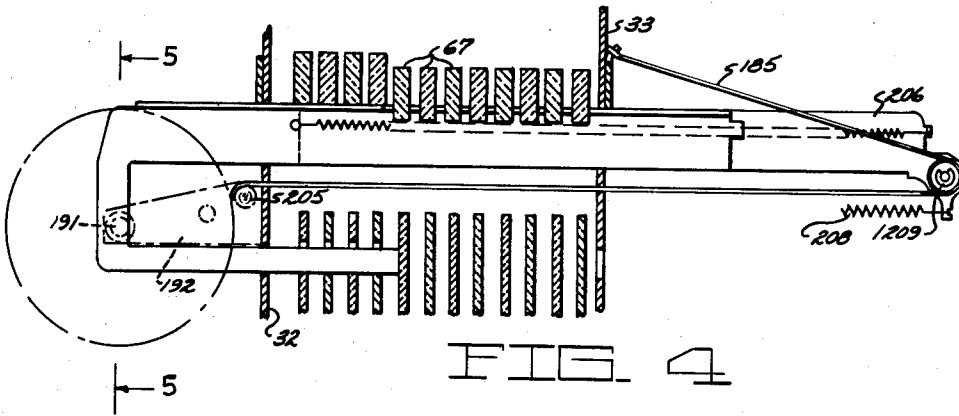


FIG. 6

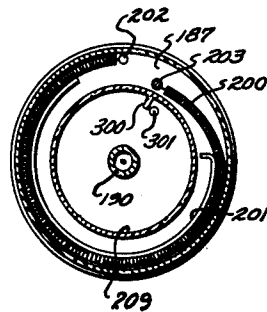
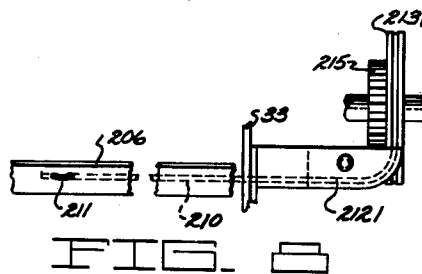
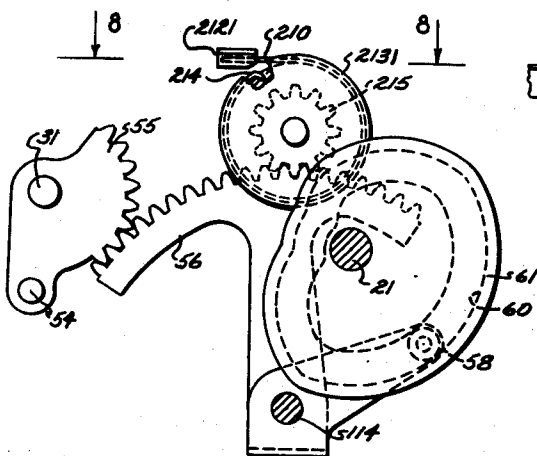


FIG. 7



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PRINTING RIBBON MECHANISM

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5 Claims. (Cl. 101—336)

This invention relates to printing-calculating machines and the like wherein a paper strip is passed between type carrying members and an impression device or devices so that an impression between the type carrying members and the impression device will transfer a printed impression onto the paper, and has particular reference to means for transferring an inked impression onto the paper.

Heretofore, machines of the above type generally utilized an elongate ink ribbon of considerable length which was incrementally fed in one direction past the type members from a first spool onto a second spool. After the ribbon supply was exhausted from one spool, the feed mechanism was automatically reversed to incrementally return the ribbon to the first spool. Such ribbon systems, although generally satisfactory, require appreciable mechanism to effect proper feeding of the ribbon and automatic reversal of the feed. Also, such ribbons are generally inconvenient to handle in threading the same between the two spools, particularly because of the ink carried thereby. Further, the ribbon also must be replaced from time to time as the ink therein becomes depleted either through use or through evaporation.

It therefore becomes a principal object of the present invention to eliminate the need for a long ink ribbon which is passed between two spools.

Another object is to continuously re-ink the portion of an ink ribbon which is actually used to transfer a printing impression between type members and the paper.

Another object is to eliminate the need for the usual ribbon feed and automatic feed reversing mechanisms.

Another object is to eliminate the need for replacing printing ribbons due to depletion of ink therein through use or evaporation.

A still further object is to provide a very simple and inexpensive printing ribbon mechanism for machines of the above type.

The manner in which the above and other objects of the invention are accomplished will be readily understood on reference to the following specification when read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a longitudinal sectional view through an adding-listing machine embodying a preferred form of the present invention.

FIG. 2 is a sectional view illustrating the cyclic clutch controls.

FIG. 3 is a sectional view taken substantially along the line 3—3 of FIG. 1 illustrating the printing ribbon mechanism in retracted condition.

FIG. 4 is a sectional view similar to FIG. 3 but is taken substantially along the line 4—4 of FIG. 1 illustrating the printing ribbon mechanism in extended condition.

FIG. 5 is a transverse sectional view through the combined ribbon magazine and inker and is taken along the line 5—5 of FIG. 4.

FIG. 6 is a sectional view through the combined ribbon

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magazine and inker and is taken along the line 6—6 of FIG. 5.

FIG. 7 is a sectional side view of the drive mechanism for the sectors, zero elimination control slide and ribbon control slide.

FIG. 8 is a sectional plan view taken along the line 8—8 of FIG. 7.

The present invention is disclosed in connection with an adding-listing machine. However, for the sake of brevity, only those parts of the machine which comprise the ribbon mechanism and those parts which cooperate with such mechanism are disclosed in detail. Reference may be had to the following copending U.S. patent applications for a disclosure of details of the machine not specifically disclosed herein.

R. E. Busch, Serial No. 130,078, filed August 8, 1961, for "Calculating Machine," and since matured into Patent No. 3,113,719, issued on December 10, 1963.

H. L. Clary et al., Serial No. 140,336, filed September 25, 1961, for "Calculating Machine."

K. F. Oldenburg et al., Serial No. 140,547, filed September 25, 1961, for "Calculating Machine."

K. F. Oldenburg, et al., Serial No. 140,549, filed September 25, 1961, for "Calculating Machine," and since matured into Patent No. 3,095,143, issued on June 25, 1963.

B. F. Kuhne, Serial No. 140,544, filed September 25, 1961, for "Calculating Machine," and since matured into Patent No. 3,094,278, issued on June 18, 1963.

Although the invention is disclosed as associated with a ten key adding-listing machine, it should be understood that the same could be equally well associated with other types of printing machines of this general class.

Referring to the drawings, amounts are entered into the machine through ten depressible amount keys 11 ranging in value from 0 to 9. Depression of an amount key sets an appropriate stop 12 in a pin carriage, generally indicated at 13, which shifts laterally of the machine into cooperative relation with combined differential actuators and printing sectors 14 whereby to differentially control the extent of advancement of such sectors during the digitizing phase of a machine cycle.

The amount keys 11 are mounted on key stems 23 which are slideable vertically in slots provided in upper and lower key frame plates 24 and 25, respectively. Tension springs 26 attached at their ends to the lower frame plate 25 extend under the key stems to normally hold the keys in raised condition.

Each key stem has an extension attached to the upper end of a flexible cable 28. The various cables are vertically aligned with each other and are slideably mounted for endwise movement in grooves 29 formed in a guide-block 30 suitably attached to the lower frame plate 25. The various cables terminate in an arcuate pattern concentric with a shaft 31 which rotatably supports the sectors 14.

The pin carriage 13 is slideably mounted at its lower end on a stationary rod 331 extending across the machine and has an extension 34 at its upper end which extends through a slot 35 formed in a channel member 36 forming part of the machine framework. The channel 36 is effective to guide the upper end of the pin carriage across the machine.

The pin carriage has a plurality of vertical columns of

stop pins 12 therein extending radially of the shaft 31 and slideable endwise in slots formed in the pin carriage. The stop pins are also located in horizontal rows aligned with the lower ends of the flexible cables 23. Thus, upon depression of a selected amount key, the respective cable 23 will be moved endwise to likewise move an aligned stop pin from its normal ineffective position shown in FIG. 1 to a position wherein it forms an abutment in the path of a shoulder 41 formed on an aligned one of the sectors 14.

An additional row of escapement pins 40 are provided above the remaining pins 12. Such pins are arranged to be set by a finger 43 of a bail 44 which is pivotally supported at 45. The bail is pivotally connected at 43 to a second bail 50 which is pivotally supported in a manner not shown for movement about an axis extending longitudinally of the machine. The bail 50 is actuated by each of the amount keys 11 upon depression thereof.

Spring means (not shown) urges the pin carriage to the left, i.e., into the plane of the drawing of FIG. 1, whereupon a raised escapement pin 40 abuts against a stationary shoulder 52 depending from the channel member 36. Thus, upon depression of any amount key to set an appropriate stop pin 12, the bails 50 and 44 are actuated to depress an aligned escapement pin 40 whereby the pin carriage may escape one column to the left.

Near the completion of a machine cycle, means (not shown) returns the pin carriage to its normal home position. During such movement, the pins 12 move over a stationary cam (not shown) which returns the same to their normal ineffective positions illustrated in FIG. 1.

The sectors 14 are yieldably driven clockwise from their home positions illustrated in FIG. 1 by a bail rod 54. The latter is mounted at its ends on gear sectors, one of which is shown at 55 (FIG. 7) fixed on the shaft 31. The latter sector meshes with a second sector 56 pivoted on a shaft 114 and carrying a follower roller 58 which engages a cam groove 60 formed on a cam 61 which is suitably attached to a cyclically operable drive shaft 21.

The bail rod 54 extends through openings 62 in the various printing sectors and is normally engaged by a detent shoulder 69 formed on a yieldable tail 64 extending integrally with each sector. As the bail rod is rocked clockwise from its home position, it will correspondingly rock the sectors 14 until they strike depressed stop pins 12 in the pin carriage during digit entry operations whereupon the detenting shoulders 69 on the tails 64 will yield, permitting the bail rod to proceed to the limit of its excursion. After the printing phase of a machine cycle, the bail rod will be returned by the cam 61 and, in doing so, the frictional engagement between the bail rod and the tails 64 will drive the sectors to their home positions where they are arrested by a stationary comb plate 212 which is engaged by pins 213 extending from the sectors. The bail rod will continue to slide along the tails 64, coming to rest adjacent edges 63 of the respective sectors.

The drive shaft 21 is driven by a suitable motor (not shown) through a cyclic clutch, generally indicated at 162 (FIG. 2). The latter comprises a pawl 163 pivotally supported at 164 on a disc 165 attached to the drive shaft 21. The pawl is urged toward engagement with a drive ratchet 166 entrained with the motor by a yieldable tail 163a thereon which engages a pin 168 on the disc. However, normally the pawl 163 is held out of driving engagement with the ratchet by a clutch dog 170. The latter is provided with slots 171 which slideably embrace frame studs 172 whereby to guide the clutch dog into and out of blocking engagement with the clutch pawl 163. The clutch dog is coupled at 173 to a control slide 174 having slots 175 which are guided over stationary projections 176 extending from the machine framework, the slide being urged to the right in FIG. 2 by a tension spring 169. The control slide has inclined camming surfaces 177 and 178 engageable by projections 279 and 280 on stems 180

and 181, respectively, of depressible machine control bars. Thus, when one or the other of such control bars is momentarily depressed, the clutch dog 170 will be withdrawn to cause a cycle of operation of the clutch 162.

The sectors 14 are effective to differentially actuate an accumulator, generally indicated at 18. As disclosed and claimed in detail in the above copending R. E. Busch application, the accumulator comprises denominationally arranged gears 75 and other elements rotatably mounted on an accumulator shaft 74. Normally, the accumulator is held in its lowered position shown in FIG. 1 wherein the gears 75 are located out of mesh with gear sections 1751 formed on respective ones of the sectors 14.

During a digitizing phase of a machine cycle, the accumulator is raised to mesh the gears 75 with the sectors 14 so as to transfer digital amounts from the sectors into the accumulator. Likewise, during totaling and subtotaling operations, the accumulator is raised to mesh the sectors for the purpose of transferring amounts from the accumulator to the sectors.

The sectors 14 also cooperate with a printing mechanism, generally indicated at 16, to print amounts registered by the sectors onto a paper strip 17. For this purpose, each sector carries a series of type characters 15 on its periphery, ranging in value from 0 to 9, the character 0 being located at the clockwisemost location relative to the rest of the series.

The paper strip 17 is fed from a supply roll 631 between feed rolls 65 and 641, through a guideway 66, past a printing station located between the sectors 14 and respective hammers 67. From such station, the strip is passed upwardly between a guideplate 182 and a transparent tear-off bar 167.

The hammers 67 are guided for endwise movement at their upper ends in guide slots formed in a cross brace 68 suitably secured at its ends to side frame plates 32 and 33 forming part of the machine framework.

The lower ends of the hammers have slots 183 therein which are guided over a guide bar 184 also attached at its ends to the frame plates 32 and 33. Leaf spring elements 70 urge the hammers downwardly toward contact with the strip 17, but are normally restrained from doing so by a rotatable cam element 71 which operates through a cam follower bail 72 pivoted at 73 to normally hold the spring elements and hammers in their illustrated upper positions.

The cam 71 is suitably entrained through gearing (not shown) with the drive shaft 21 so that during the printing phase of a cycle, the cam permits the spring 70 to impel the hammers 67 downwardly to cause an imprint of selected type characters 15 onto the strip 17. Immediately thereafter, the cam 71 is effective to retract the hammers toward their normal upper positions.

According to the present invention, the printing ribbon 185 is relatively short and has the effective inking portion thereof normally housed within a cylindrical magazine or container 186 (FIGS. 3 to 6, inclusive). The latter comprises a housing side wall 187 to which is secured a cup-shaped housing shell 188. The side wall has a tubular sleeve 190 integral therewith which, when the magazine is in place on the machine, fits over a stud 191 extending from a bracket 192 which is attached to the frame plate 32. The magazine is prevented from rotating by means of a stud 193 thereon which fits into a mating hole in the bracket.

Within the shell 188, a spool 194 is rotatably mounted on the sleeve 190 and is formed of two flanges or radial walls 195 and 196 held in spaced relation to each other by studs 197. A core 198 of felt or similar material impregnated with a suitable ink is attached between the flanges of the spool. One end of the printing ribbon 185 is attached to one of the studs 197 and is normally wrapped around the core 198 to transfer ink thereto from the core.

A tension spring 200 is fitted over a partial annular

flange 201 integral with the side wall 187 and is attached at one end to a stud 202 extending from the latter wall. The opposite end of the spring is attached to a stud 203 extending from the spool 194, thus tending to maintain a projection 300 on the spool in engagement with a stud 301 on the wall 187, in which condition the ribbon is wrapped around the ink impregnated core 198. The studs 202 and 203 are located adjacent an opening in the flange 201 formed by the adjacent ends thereof. The flange 201 extends in overlapping relation to a similar annular flange 209 extending from the radial wall 196 of the spool.

The free end of the ribbon is passed through a slot 204 in the side of the magazine and over a roller 205 rotatably supported by the bracket 192. Thence, the ribbon is guided between the various sectors 14 and their respective hammers 67 directly below the path of the paper strip 17. The ribbon is guided around a second roller 1209 carried by a slide 206 and is provided with an eyelet 207 at its end which is suitably anchored to a piece 307 attached to the frame plate 33.

The slide 206 is mounted for endwise movement in guides formed in the side plates 32 and 33 and is normally urged to the left into its retracted position shown in FIG. 3 by a tension spring 208 extending between a suitable part of the machine framework and the right-hand end of the slide.

A cable 210 (FIGS. 7 and 8) is attached at one end 211 to the slide and is passed over a stationary guide 2121 suitably attached to the side plate 33 from whence it is guided onto the periphery of grooved pulley 2131, being attached thereto at 214. The pulley is attached to a gear 215 maintained in mesh with the aforementioned gear sector 56.

Normally, when the machine is in its full cycle or rest position, the spring 208 will hold the slide in its left-hand position shown in FIG. 3 and the spring 200 will be effective to maintain the left-hand or inked portion of the printing ribbon wrapped in contact with the spool core 194. In this condition, ink is transferred to the left-hand portion of the ribbon and such inked portion of the ribbon is protected from dust and dirt by virtue of its retention within the magazine. Also, because of the retention of the inked portion of the ribbon within the magazine, evaporation of ink from the ribbon, as well as from the core, is materially reduced.

Shortly after a machine cycle is initiated, the sector 56 is rocked counterclockwise, causing the pulley 2131 and cable 210 to draw the slide 206 rightwardly into its position shown in FIG. 4 wherein the inked portion of the ribbon will be withdrawn from the magazine and will extend between the sectors 14 and the printing hammers 67. This withdrawal will be completed before the printing phase occurs so as to transfer an inked impression from the type sectors onto the strip 17. Subsequently, the sector 56 is retracted, allowing the springs 200 and 208 to return the parts to their normal positions.

The printing ribbon 185 and magazine are replaceable as a unit and when it is desired to replace the same, the eyelet 207 is removed from its anchor and the magazine is merely lifted off the stud 191 and a new magazine and ribbon replaced in its stead.

Although the invention has been described in detail and certain specific terms and languages have been used, it is to be understood that the present disclosure is illustrative rather than restrictive and that changes and modifications may be made without departing from the spirit or scope of the invention as set forth in the claims appended hereto.

Having thus described the invention, what is desired to be secured by United States Letters Patent is:

1. In a printing machine having a group of type elements arranged in side by side relation, means for guiding a record medium past said type elements, a machine frame part and cyclically operable means for effecting a printing impression between said record medium and said type ele-

ments; the combination comprising a ribbon housing, means for removably mounting said housing on said machine frame part, a ribbon spool for supporting a printing ribbon, means rotatably supporting said spool in said housing, an annular flange extending inwardly from one side wall of said housing and coaxially of said spool, said flange having an opening therein, a tension spring wrapped around said flange, means adjacent said opening for attaching one end of said spring to said spool, means adjacent said opening for attaching the other end of said spring to said housing, said spring normally maintaining a portion of said ribbon on said spool, and means for first withdrawing said ribbon from said spool whereby to locate said portion intermediate said type elements and said record medium and for thereafter enabling said spring to rotate said spool whereby to withdraw said ribbon into said housing.

2. A printing ribbon magazine for printing machines and the like comprising a ribbon housing, means for removably mounting said housing on a machine frame part, a ribbon spool for supporting a printing ribbon, means rotatably supporting said spool in said housing, an annular flange extending inwardly from one side wall of said housing in juxtaposition with said spool and coaxially of said spool, said flange having an opening therein, a tension spring wrapped around said flange, means adjacent said opening for attaching one end of said spring to said spool, and means adjacent said opening for attaching the other end of said spring to said housing.

3. A printing ribbon magazine for printing machines and the like comprising a ribbon housing, means for removably mounting said housing on a machine frame part, a ribbon spool for supporting a printing ribbon thereon, means rotatably supporting said spool in said housing, a first annular flange extending coaxially of and outwardly from said spool into juxtaposition with one side wall of said housing, a second annular flange extending inwardly from said side wall of said housing into overlapping relation with said first flange, said second flange being coaxial with said spool, said second flange having an opening therein, a tension spring wrapped around said second flange, means adjacent said opening for attaching one end of said spring to said spool, and means adjacent said opening for attaching the other end of said spring to said housing.

4. A printing ribbon magazine for printing machines and the like comprising a ribbon housing, means for removably mounting said housing on a machine frame part, a ribbon spool including a radial wall; means rotatably supporting said spool in said housing, a first annular flange extending coaxially of said spool and outwardly from said radial wall into juxtaposition with a side wall of said housing, a second annular flange of larger diameter than said first flange, said second flange extending coaxially of said first flange and inwardly from said side wall into overlapping relation with said first flange, said second flange having an opening therein, a tension spring wrapped around said second flange, means adjacent said opening for attaching one end of said spring to said spool, means adjacent said opening for attaching the other end of said spring to said housing, a second radial wall on said spool on the side of said first mentioned radial wall opposite said flanges, and ink absorbent material between said radial walls for supporting a printing ribbon.

5. A printing ribbon magazine for printing machines and the like comprising a ribbon housing, means for removably mounting said housing on a machine frame part, a ribbon spool including a radial wall, means rotatably supporting said spool in said housing, a first annular flange extending coaxially of said spool and outwardly from said radial wall into juxtaposition with a side wall of said housing, a second annular flange of larger diameter than said first flange, said second flange extending coaxially of said first flange and inwardly from said side wall into overlap-

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ping relation with said first flange, said second flange having an opening therein, a tension spring wrapped around said second flange, means adjacent said opening for attaching one end of said spring to said spool, means adjacent said opening for attaching the other end of said spring to said housing, a second radial wall on said spool on the side of said first mentioned wall opposite said flanges, spaced studs on one of said radial walls for maintaining said second radial wall spaced from said first mentioned radial wall, and ink absorbent material between said radial walls for supporting a printing ribbon, said material surrounding said studs.

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