Feb. 13, 1962 P. J. THUT ET AL 3,020,841

PRINTING APPARATUS AND INKING ARRANGEMENT THEREFOR

Original Filed Dec. 29, 1955 6 Sheets-Sheet 1

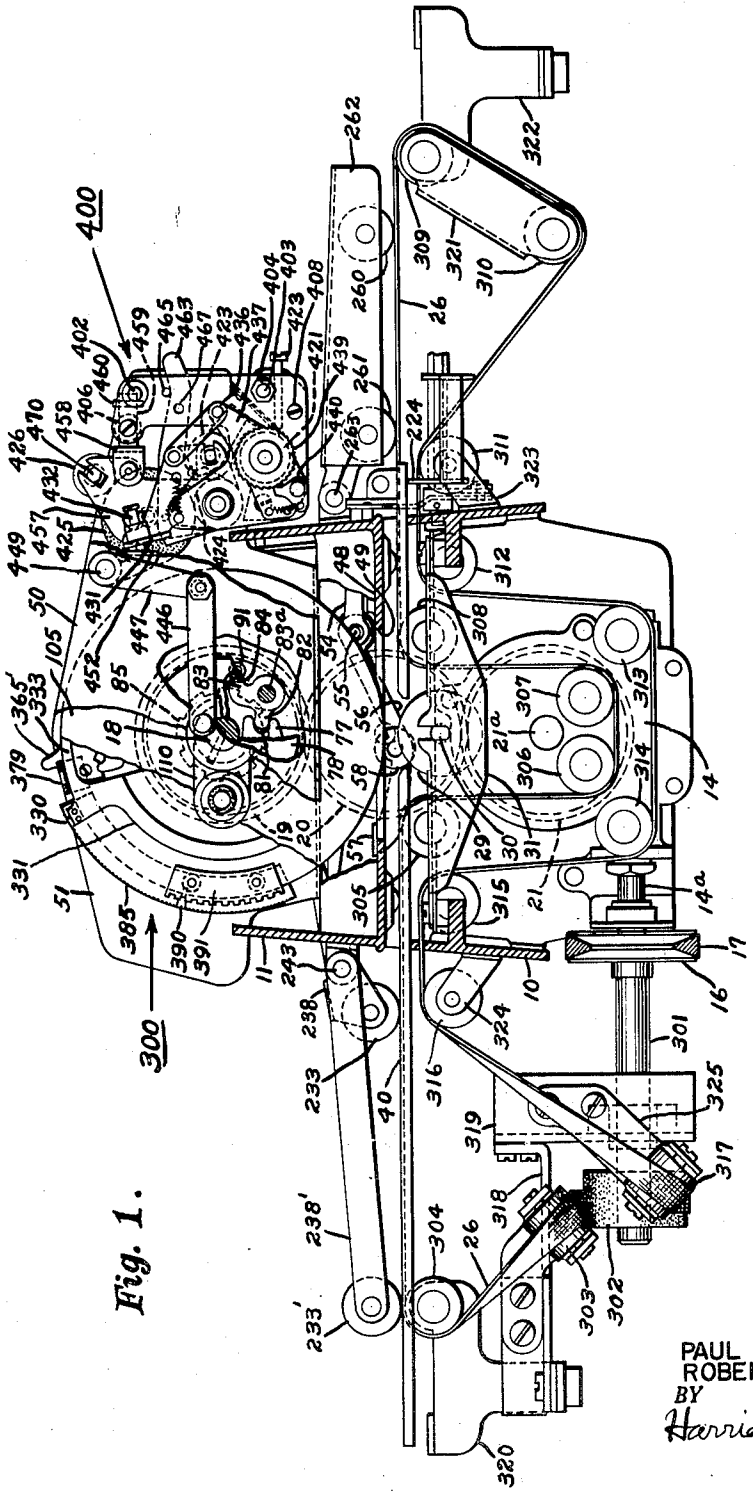


Fig. 1.

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Fig. 10.

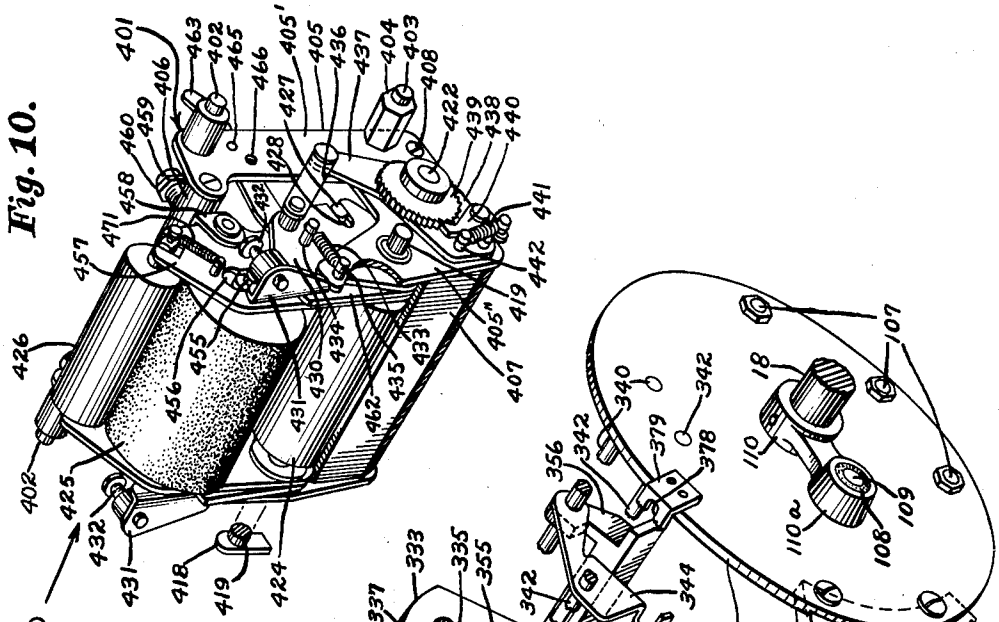
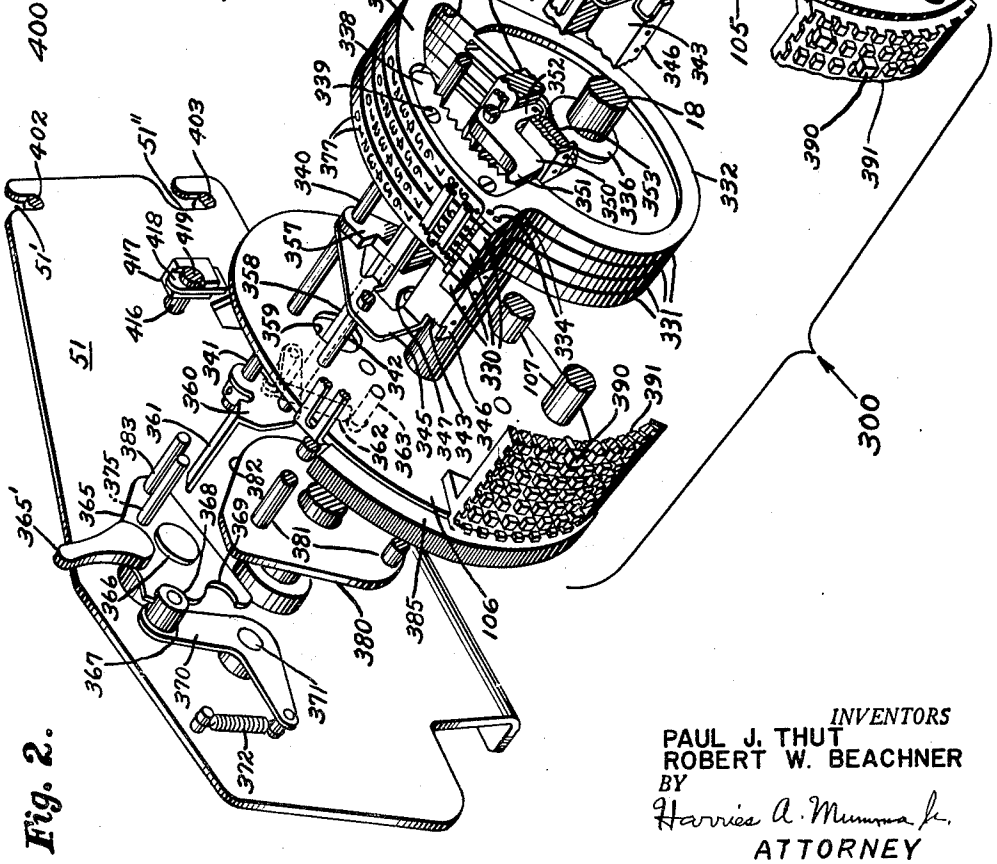


Fig. 2.



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Fig. 3.

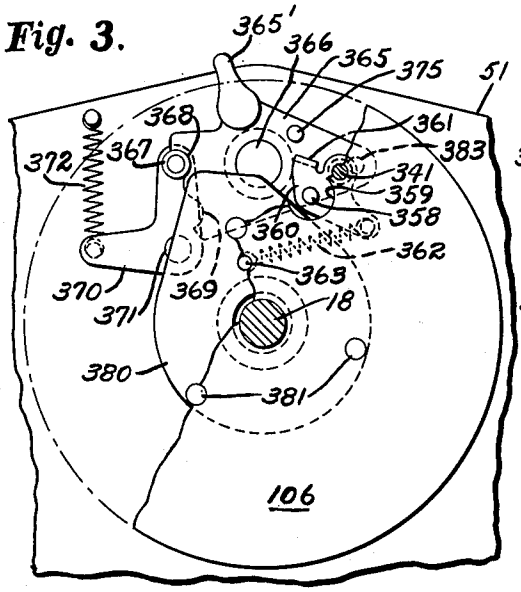


Fig. 5.

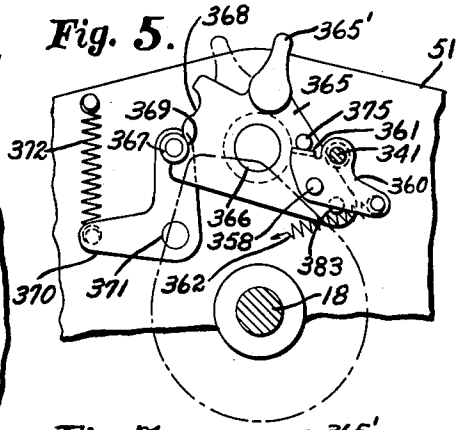


Fig. 7.

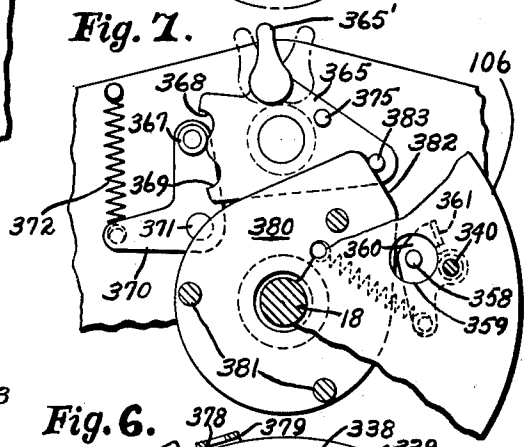


Fig. 4.

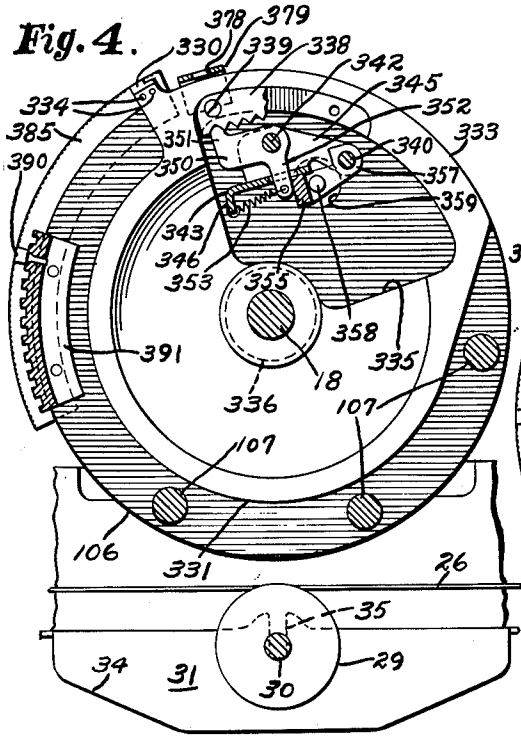
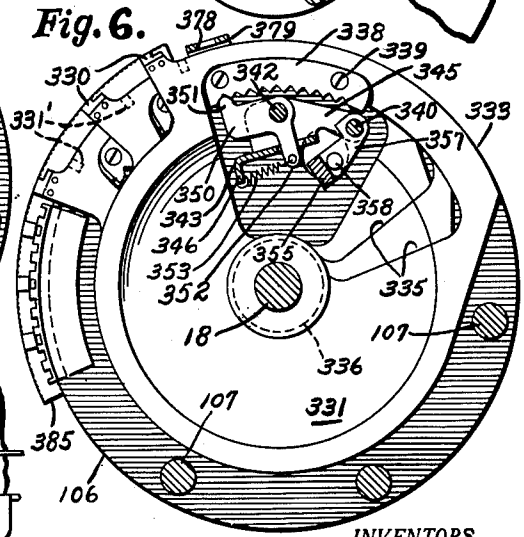


Fig. 6.



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Fig. 8.

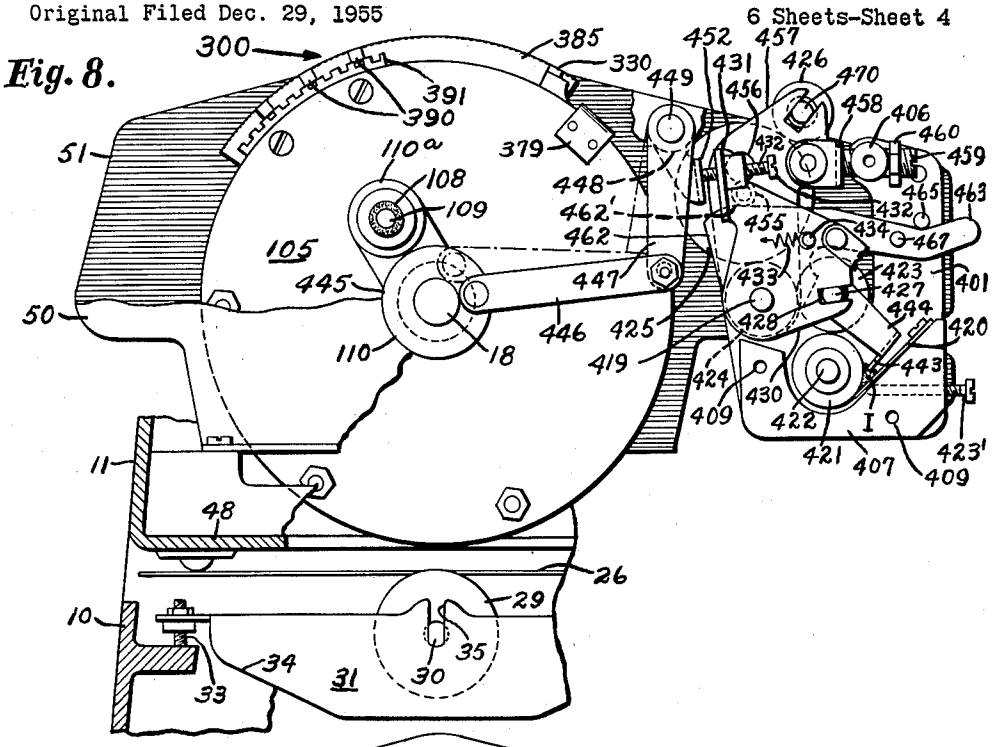
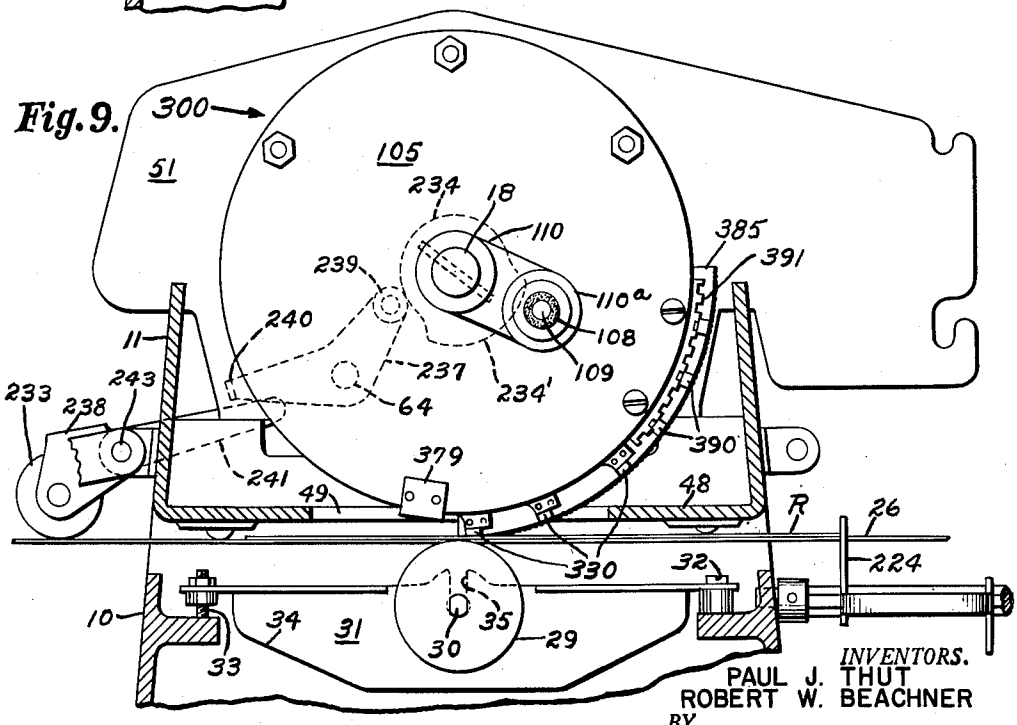


Fig. 9.



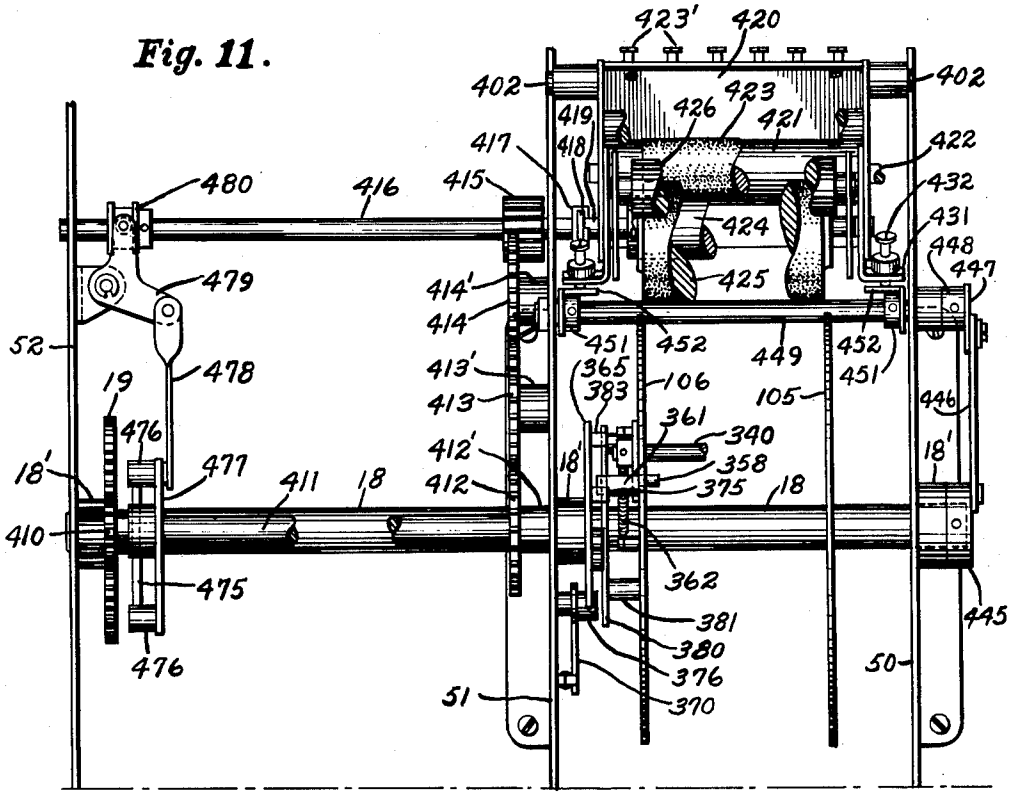
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PRINTING APPARATUS AND INKING ARRANGEMENT THEREFOR

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Fig. 11.



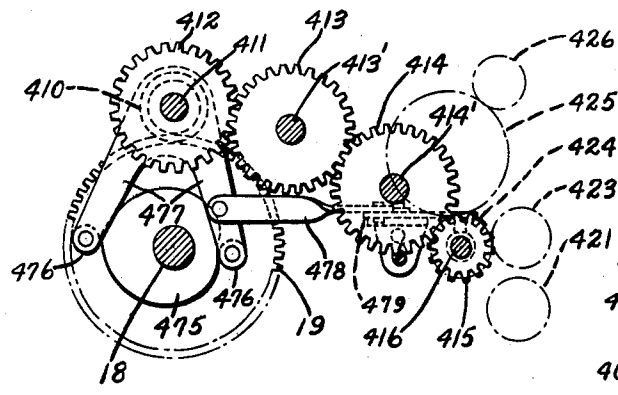


Fig. 12.

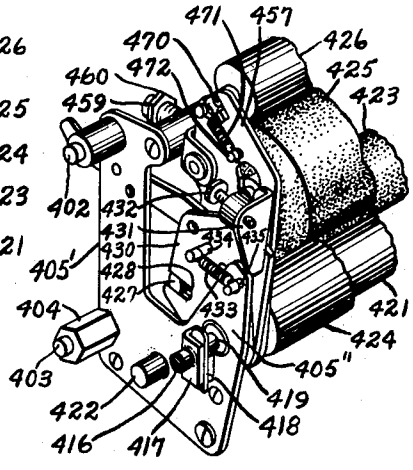


Fig. 13.

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PRINTING APPARATUS AND INKING ARRANGEMENT THEREFOR

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Fig. 14.

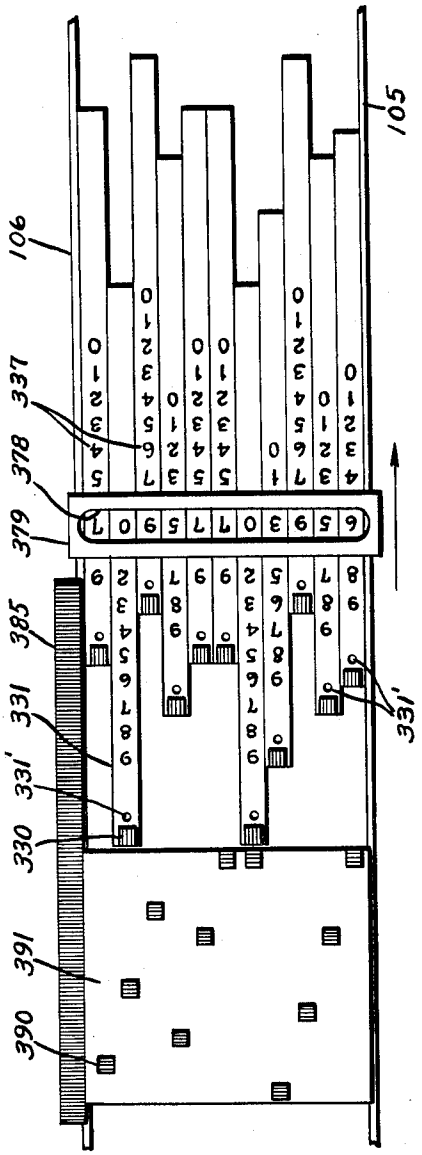
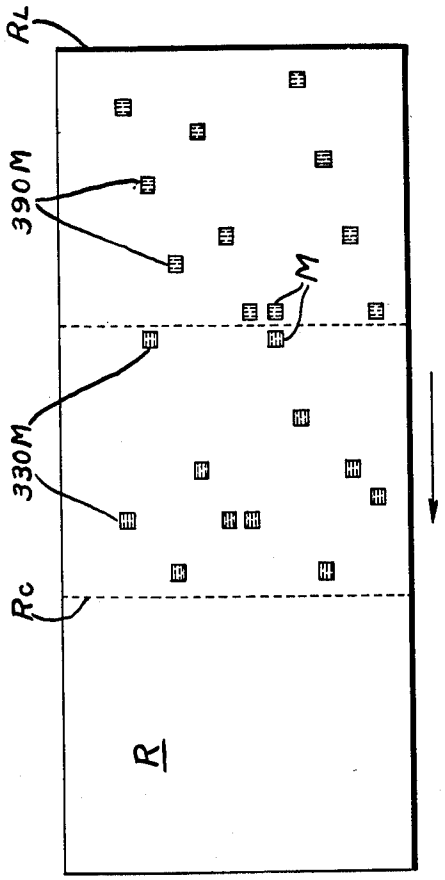


Fig. 15.



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United States Patent Office

3,020,841

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3,020,841

PRINTING APPARATUS AND INKING ARRANGEMENT THEREFOR

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Original application Dec. 29, 1955, Ser. No. 556,360, now Patent No. 2,933,038, dated Apr. 19, 1960. Divided and this application Dec. 2, 1959, Ser. No. 856,762

1 Claim. (Cl. 101—350)

This invention relates to printing apparatus and primarily such apparatus of the type having a rotary printing member carrying the printing elements or plate, and it relates particularly to an ink fountain arrangement for supplying ink to a printing element such as the element or plate affixed to a rotary printing member.

The printing apparatus with associated inking arrangement of the invention is described in the present specification in the form of a code recording apparatus for recording printed impressions on a record member at differential positions thereon to represent and store data which can be conveniently sensed by automatic equipment for "reading" the printed impressions. The present application is a division of an application for Letters Patent of the United States entitled "Code Recording Apparatus," Serial No. 556,360, filed December 29, 1955, in the names of Paul J. Thut and Robert W. Beachner and assigned to the same assignee. Application Serial No. 556,360 issued on April 19, 1960, as Patent No. 2,933,038.

Code recording apparatus of the type described is particularly useful for recording data-representing impressions on the record member in the form of discrete markings, or spots, of a fluorescent material which is normally invisible but which has the property of fluorescence under the influence of, e.g., ultra violet light. It will be appreciated as the description proceeds that the apparatus can be used also for applying printed impressions of similar shapes which are visible under ordinary illumination. Inks used for printing these impressions or spots conveniently may be formulated to be quite viscous and may employ as vehicles non-drying or other liquids which present special problems in effecting smooth transfer of suitable quantities from the ink reservoir to the printing elements or type. Ink fountains and other inking arrangements of conventional design may give uneven application of the ink to the printing elements and may be subject to clogging and other difficulties causing poor printed impressions and maintenance difficulties.

It is an object of the present invention, therefore, to provide a new and improved printing apparatus involving an arrangement for inking a rotary or similar printing member which avoids one or more of the disadvantages of conventional printing apparatus and of prior known inking arrangements therefor.

Another object of the invention is to provide a new and improved ink fountain for printing apparatus which is a self-contained and easily removable inking arrangement therefor and which applies a fine and uniform coating of ink to the printing elements during each cycle of operation of the apparatus.

A further object of the invention is to provide, for printing apparatus of the rotary cylinder type, a new and improved inking arrangement for transferring ink from a reservoir to distributing rollers and thence to an inking roller arranged to contact the printing cylinder.

It is yet another object of the invention to provide printing apparatus having a group of ink-transferring rolls and provisions for driving the rolls which provide a new and improved ink fountain arrangement for the printing apparatus.

These and still further objects and advantages of the

present invention will be apparent from the description hereinbelow as illustrated by the drawings.

The described printing apparatus incorporating the invention comprises a rotary printing member and means for rotating this member through separate printing cycles and for initiating the cycle, and peripheral printing elements carried by the rotary member, means for feeding a record sheet into printing position with respect to the printing elements also being provided conventionally. For effecting inking there is provided additionally an ink reservoir, a pickup roll with a longitudinal portion of its circumference disposed for contact with ink in the reservoir, means for rotating the pickup roll in incremental amounts determined by the operation of the printing apparatus, and a series of distributor rolls having axes parallel to the axis of the pickup roll and having surfaces in mutual frictional rotational driving contact but spaced from the surface of the pickup roll; the inking arrangement further comprises means for rotatably mounting one of the series of distributor rolls, this means including a cradle pivotable about an axis coaxial with the axis of a contiguous distributor roll, means coupled to the cyclically rotatable printing member for rocking the cradle about this axis to move the aforesaid one distributor roll from its spaced relationship with the pickup roll into and then back out of ink-transferring relationship therewith, once during each rotation of the printing member; while maintaining driving contact between that distributor roll and the roll contiguous thereto, an inking roll the surface of which is disposed in frictional rotational driving contact with a roll in the series of distributor rolls and also is disposed in inking relationshp to the printing member of the printing apparatus, and means for driving one of the distributor rolls to effect continuous rotation of all of the distributor rolls and of the inking roll during operation of the printing apparatus.

The printing apparatus described applies the record impressions in the form of discrete markings, or spots, of a fluorescent ink composition which is colorless and normally invisible but which is rendered visible or detectable by automatic "reading" equipment when subjected to, e.g., ultra violet light. The ink composition utilized can be one incorporating finely dispersed phosphorescent pigments, such as zinc or zinc-cadmium sulfides, in a carrier or binder. The ink composition, being colorless, is essentially invisible under artificial light or daylight so as not to obscure any printed material on the check, and has the further property of enabling visible penned or printed marks to be applied thereover. Each of the fluorescent markings or spots, however, applied by the recording elements of the described apparatus is about 0.125 inch square, which is almost ten times larger than what is actually required to be detected by the "reading" equipment. Accordingly, any superimposed visible markings or perforations would not be likely to remove a whole spot or enough of one to produce an erroneous "reading."

The code markings in the apparatus disclosed represent data which are the same for all checks in a batch but which it may be desirable to change for different batches. An illustration of this type of data is the account number of a bank customer to be impressed by the bank on a supply of blank checks so that it appears on all the checks written by that customer. However, it may also be desirable to apply further data which are relatively constant for all batches of checks coded by the particular apparatus, such as the bank number and routing symbol applicable to the particular bank coding the checks. For that purpose, the described apparatus includes an additional group of recording elements which are fixed in differential positions along the circumference of the rotary member to apply these further, relatively constant data.

The described apparatus is continuously fed with a batch of record sheets or checks. As each record sheet moves into recording position with respect to the rotary recording member, a clutch, controlled by a roller in the path of the record sheet movement, is tripped to initiate a cycle of operation of the rotary member. A stop, also in the path of movement of the record sheet, positions the leading edge of the latter so that it will be at a predetermined distance from a sheet gripping surface on the circumference of the rotary member when the check is engaged by the gripping surface at the beginning of the recording part of the cycle.

The recording apparatus is arranged to apply the record impressions in the form of printed fluorescent ink markings or spots, and includes in exemplification of the invention an ink fountain for inking the recording elements during each cycle of operation of the rotary member. The known fluorescent ink compositions are frequently very viscous and difficult to spread evenly and uniformly on the recording elements. Moreover, it is necessary that only a minute amount of ink be transferred to the recording elements and that the ink transferred be evenly distributed thereover, so that the marks applied to the record sheets will dry very quickly. The described apparatus utilizes a self-contained, easily removable fountain which receives from the ink reservoir only a small amount of ink during each cycle of the recording apparatus and which thoroughly distributes the ink over a plurality of rolls before transferring it to the recording elements.

The printing or recording apparatus hereinafter described has been incorporated in apparatus generally similar to the printing apparatus illustrated in U.S. Patent No. 2,071,139, granted February 16, 1937, and assigned to a corporate assignee since merged with the assignee of the present invention. The Patent No. 2,071,139 and the aforementioned application Serial No. 556,360 disclose certain details of construction and give a somewhat more complete description of the features embodying such details.

In the drawings, which are taken from the last-mentioned application:

FIG. 1 is a side elevational view of the printing and code recording apparatus embodying the present invention, in which certain parts are removed and others broken away to more clearly show the internal structure;

FIG. 2 is an exploded perspective view of the rotary member and its recording elements utilized in the code recording apparatus of FIG. 1;

FIG. 3 is a side elevational view of a manual locking means for the settable elements, such means being shown in locking position;

FIG. 4 is a view of a settable recording element in locked position;

FIG. 5 is a view similar to FIG. 3 illustrating the manual locking means in unlocking position;

FIG. 6 is a view similar to FIG. 4 of a settable recording element in unlocked position to permit changing its setting;

FIG. 7 illustrates the manual locking means, in the event such means were inadvertently left unlocked, being automatically locked upon cycling of the rotary member;

FIG. 8 illustrates the rotary member and the inking fountain for its printing and recording elements at the early part of a cycle of operation of the rotary member;

FIG. 9 illustrates the rotary member at the beginning of a printing or recording action during its cycle of operation;

FIG. 10 is a perspective view of the ink fountain;

FIG. 11 is a top plan view of the ink fountain and the drive mechanism therefor;

FIG. 12 is a diagrammatic view of the drive mechanism for the ink fountain, this figure also illustrating the five rolls thereof in broken lines in their normal positions with respect to each other;

FIG. 13 is a partial perspective view illustrating the side of the ink fountain connectable to its drive mechanism;

FIG. 14 is an expanded diagrammatic view of the rotary recording member illustrating the sheet gripping means and the differentially positioned printing and recording elements; and

FIG. 15 illustrates a record sheet showing the fluorescent spots thereon in their coded positions corresponding to the differential positions of the recording elements of FIG. 14.

General construction

As mentioned earlier, the invention as hereinafter described has been incorporated in apparatus similar in general construction to the printing apparatus shown in Patent No. 2,071,139. As an aid in understanding the present description, the elements generally similar to those described in the above patent will be correspondingly numbered throughout the following description, and the generally different or new elements will be numbered starting with "300."

Referring to FIG. 1, the described apparatus comprises a base or frame **10** having a casing **11** mounted thereon adapted to be enclosed by a cover (not shown). The means for driving the apparatus are supported on the base and comprise an electric motor and motor-pulley (not shown) and a pulley **16** driven from the motor-pulley through belt **17**. Pulley **16** drives a worm shaft **14***a*, extending into worm housing **14**, which in turn drives a shaft **21***a*. The latter shaft is secured to a gear **21** meshing with an intermediate gear **20** which in turn meshes with another gear **19**. The latter gear drives the recording cylindrical member **300** coupled to a shaft **18** through the medium of a clutch mechanism which is engaged for each cycle of operation of the rotary member as will be explained below. Pulley **16** also drives another shaft **301** carrying a roller **302** at one end thereof which drives the record sheet, or check, feeding belt **26** as will be hereinafter described.

A platen roller **29** is supported beneath the rotary recording member **300** by a stud **30** on a supporting member **31** secured to the base **10** by means of a screw **32** and an adjustable stud **33** (see FIG. 9). The platen supporting member **31** includes oppositely disposed side portions **34** having slots **35** therein which receive the flattened ends of the stud **30** whereby the latter is prevented from rotating.

The record sheets, such as checks, to be impressed with the coded information are designated R. The checks are continuously fed from the left side of the machine of FIG. 1 from a receptacle (not shown) onto the belt **26**, from there into recording position between the roller platen **29** and the rotary recording member **300**, and thenceforth into a discharge receptacle (not shown). The check feeding belt **26** is a single endless loop having a check-conveying portion on one side of the platen and another check-conveying portion on the other side of the platen. A pair of spaced guide members **40** (FIG. 1) straddling the above two portions of the belt **26** guide the check through the apparatus. The guide members may be supported and independently adjusted for different size checks by any suitable means such as for example shown in Patent No. 2,071,139.

The belt is driven by roller **302** and is guided by rollers **303** and **304** to the path of movement of the checks through the machine. From roller **304** the belt conveys the checks to the platen **29**, the belt then dropping below the platen as guided by rollers **305**, **306**, and **307**, and reappearing in the check path on the other side of the platen on roller **308**. The belt then extends in the path of movement of the checks to end roller **309**, and is finally returned by rollers **310**—**317** to the drive roller **302**. The belt rollers may be supported by any suitable means from the frame or base **10** of the apparatus. In the described apparatus, bracket **318** secured to frame members **319** and **320** supports roller **303**,

bracket 321 secured to frame member 322 supports rollers 309 aand 310, bracket 323 supports roller 311, bracket 324 supports roller 316, and bracket 325 secured to frame 319 supports roller 317. The remaining belt rollers may be supported directly by the base or frame 10 by any suitable means.

The casing 11 of the apparatus is provided with a bottom wall 48 having an opening 49 therein, the side walls of the casing being connected by transverse plate members 50 and 51 fastened to the bottom wall by their respective securing flanges. An additional plate member 52 is secured to the casing adjacent one end thereof (see FIG. 11). The plate members 50—52 are provided with bearings 18' in which the shaft 18 is mounted for rotation by gear 19 through a clutch mechanism referred to hereinbelow.

Cyclic control of recording cylinder

The disclosed apparatus provides means for driving the rotary recording cylinder 300 through cycles of operation, and further means for initiating a cycle of operation at the proper time. The latter means is controlled by the movement of a check into recording position which is sensed by a roller disposed in the path of the check movement to control the clutch which couples the recording cylinder to its drive.

FIG. 1 illustrates the means for sensing the movement of the check into recording position and the power clutch mechanism controlled thereby for cycling the rotary recording member 300, this mechanism being similar to that disclosed in the aforementioned Patent No. 2,071,-139. Secured on the bottom wall 48 of the casing are a pair of brackets 54 in which the opposite ends of a rod 55 are journaled. The rod has an arm 56 secured thereon, the arm having an offset portion 57 at its free end which normally rests on the bottom wall of the casing. Arm 56 is provided intermediate its ends with a roller 58. As the check is advanced through the machine by the belt 26, it will pass under roller 58 thereby lifting arm 56. Roller 58 and its arm 56 thereby serve to detect the movement of the check into recording position. As arm 56 is lifted by the check, it rocks rod 55 which, through further mechanism shown in Patent No. 2,071,-139, trips a clutch stop arm 77 to couple a clutch disk 78, pinned on the driven shaft 18, with the continuously running drive gear 19. It will be appreciated that the present invention does not depend on the construction of the particular clutch mechanism; therefore, although it is described to some extent in the aforementioned application Serial No. 556,360, it will not be described in the present specification, and reference may be made to the above-mentioned Patent No. 2,071,139 for a detailed discussion of such arrangement. In brief, the lifting of arm 56 trips the clutch mechanism; at the end of one cycle of rotation clutch dog 83 is disengaged from a constantly rotating drive member 85, disconnecting the driven shaft 18, as described in the aforementioned patent.

Recording cylinder and settable recording elements

The rotary recording cylinder 300 driven by shaft 18 is shown in FIG. 2. As previously mentioned, the rotary member 300 carries the recording elements which are differentially positioned along its circumference for applying the data-representing impressions on the record sheets or checks R.

The rotary recording cylinder 300, comprising a pair of circular end plates 105 and 106 connected by three cross rods 107, is loosely mounted on shaft 18 between the frame plates 50 and 51 of the casing 11. A coupling member 110 fixed to shaft 18 has an extension thereof 110*a* fixed to end plate 105 of the recording cylinder by means of a stud 109 passing therethrough and secured in the end plate. An insert 108 of shock absorbing material cushions this coupling between stud 109 and the extension 110*a*. The rotary motion from shaft 18 is thereby transmitted by member 110 to the recording member 300.

The recording elements of the cylinder 300 are in the form of metal blocks 330, each of which is fixed to a settable circular disk, or ring, 331 freely mounted on shaft 18 between end plates 105 and 106 of the cylinder. In the embodiment described, there are eleven such recording elements and settable disks, the disks substantially filling the space between the end plates 105 and 106, as shown in FIG. 14.

Each of the settable disks 331 comprises a section 332 of a radius smaller than that of end plates 105 and 106 to provide space for the cross rods 107, and another section 333 of a radius substantially equalling that of the end plates. The recording element 330 of each settable disk is secured by fasteners 334 to a projecting end of the latter section so that it can be considered on the circumference of the rotary cylinder 300.

The settable disks 331 are freely mounted on shaft 18 so that they, and the recording elements 330 carried thereby, can be settable to differential positions along the circumference of the rotary cylinder 300. In the disclosed embodiment, the recording elements are settable to their differential positions by manual means, since the data to be represented thereby (e.g., the coded account number to be applied to a batch of checks) is not ordinarily to be changed for each machine cycle but is to be the same for a large number of machine cycles. It will be appreciated, however, that the apparatus disclosed is also susceptible for use with automatic means for setting the recording elements where the apparatus is to be used in applications requiring more frequent resetting.

To permit the setting of the recording elements 330 in their data-representing differential positions along the circumference of the rotary member 300, each of the disks 331 has a somewhat triangular shaped opening 335 intermediate its hub 336 and its rim 337 of its larger-radius section 333. The rim 337 in each disk contiguous to this opening is provided with a recess to accommodate an indexing segment 338, having a plurality of spacing teeth, secured therein by fasteners 339.

A shaft 340 passes through the space formed by openings 335 of all the disks and has one end thereof seated in an aperture in end plate 105 and its opposite end extending through an aperture in end plate 106 and terminating in extension 341. Another shaft 342 extends through openings 335 of the settable disks, parallel to shaft 340, and has its opposite ends seated in apertures in end plates 105 and 106. The two shafts 340 and 342 support a yoke member 343 by means of upstanding arms 344 and 345 at each end of the yoke member. The yoke member is formed with a depending flange 346 and an elongated slot 347 both extending for substantially its entire length between the two arms 344 and 345.

Each of the settable disks 331 is yieldingly retained in its set position by a pawl 350 for each disk pivotally mounted on shaft 342, each pawl having a retaining dog 351 cooperable with the teeth of its respective indexing segment 338. The pawls 350 are formed with depending arms 352 disposed in the elongated slot 347 of the yoke member, and their retaining dogs 351 are tensioned clockwise into engagement with the teeth of their respective indexing segments 338 by springs 353 each fastened at one end to the depending arm 352 of the pawl and at its other end to flange 346 of the yoke member. The foregoing elements thereby permit the setting of the disks 331 along the circumference of the rotary cylinder 300 and yieldingly retain the disks in their set positions.

Means are provided for locking and unlocking the disks 331 in their set positions. These means and their operation are described in detail in the aforementioned application Serial No. 556,360, with particular reference to FIGS. 2–7 of the drawings in that application, which

are the same as the drawings appended hereto. These means are not important to the present invention, and they need not be discussed herein except to point out that mechanism is provided not only to retain the disks 331 locked in their preset differential positions while the rotary recording member 300 is cycled, but also to lock them automatically at an early part in the recording or printing cycle should the member 300 be cycled with the disk elements inadvertently left in an unlocked condition. To permit resetting the settable disks 331, they may be unlocked through an arrangement which is actuated by manually rocking a lever 365 clockwise by its extension 365' to the position shown in FIG. 5, all as described in the application Serial No. 556,360. Actuation of the unlocking arrangement, as indicated in FIG. 6, permits the pawls 350 to yield (counter-clockwise) as the settable disks 331 are reset to new differential positions along the circumference of the rotary recording cylinder 300. Once the settable disks are unlocked, they may be moved to their new positions by any suitable means such as manually with the aid of a tool having a hooked end adapted to enter aperture 331' (FIG. 14) in the individual disks 331. The disks are provided with visible numbers 377 (FIG. 14) corresponding to the differentially set positions of their recording elements, the numbers being visible through a sight opening 378 in a plate 379 secured to end plates 105 and 106.

The recording elements 330 are settable by the foregoing structure to differential positions along the circumference of the rotary cylinder 300 with respect to an index point on the rotary member. This index point in the disclosed apparatus is represented by a sheet gripping surface provided on the circumference of the rotary cylinder and is defined by the leading edge of this gripping surface. This surface is formed by a curved plate 385 having sheet gripping projections, produced by transverse grooves, fastened to end plate 106 of the recording member 300 along the circumference thereof.

These projections on plate 385 extend substantially the same distance from the axis of rotation of the cylinder as the recording elements 330 so that they will grip the record sheets and move them in the direction of rotation of the cylinder as the recording elements apply the record impressions to the checks. The index point on the rotary member, i.e., the leading edge of the sheet gripping plate 385, bears a predetermined relationship with respect to a reference on the check when engaged thereby at the beginning part of the cycle to assure that the code impressions applied by the recording elements 330 will be at their precise differential positions with respect to the reference on the check. This reference would thereby serve also as a reference in subsequent decoding of the coded information by the "reading" apparatus.

In the disclosed embodiment, the reference point on the check is taken at its leading edge as it is fed through the mechine. This conveniently permits the utilization of the automatic stop means disclosed in the aforementioned Patent No. 2,071,139 for arresting the movement of the check at the precise position where its leading edge would bear the above predetermined relationship with the sheet gripping plate 385 when the latter first engages the check at the beginning of the recording part of the cycle.

To complete the description of the printing apparatus comprising inking means, further mechanism, including automatic stop mechanism and feeding and ejecting rollers, for effecting passage of record sheets through the apparatus during the printing cycle now will be described. Also mentioned hereinbelow are certain additional printing or type elements, in the form of fixed recording elements provided on the rotary cylinder 300 in addition to the settable elements 330, after which there follows a description of the inking arrangement or fountain.

Automatic stop mechanism

This stop means, as disclosed in the Patent No. 2,071,139, includes a stop element 224 positionable in the jath of the record sheets R as they are fed through the machine by the conveyer belt 26. (See FIGS. 1 and 9.) The stop element 224 is urged to its upper position (shown in FIG. 9) to arrest the movement of the check but is normally retained in its lower position out of the check path (as shown in FIG. 1) by mechanism described in the above patent. As the record sheet is fed into recording position between the rotary cylinder 300 and the platen 29, roller 58 with its arm 56 (FIG. 1) is raised, as heretofore described, to release the stop element 224 into the check path thereby arresting the check from further movement by the belt. As shown in FIG. 9, the stop element thereby positions the check so that its leading edge bears the required predetermined relationship with respect to the leading edge of the sheet gripping plate 385 at the time it is first engaged thereby at the start of the recording part of the cycle. As the cycle of the rotary cylinder 300 continues, the sheet gripping plate 385 thereof grips the edge of the check and reverses its movement as the recording elements 330 apply the data-representing impressions on the check. This arrangement, including the stop element 224, assures that the record impressions applied to the check with its leading edge as a reference will correspond to the differentially set positions of the recording elements 330 with respect to the leading edge of the sheet gripping plate 385 taken as an index point.

The stop element 224 remains in its raised position until the sheet gripping plate 385 has engaged the check, and preferably until the latter part of the completed cycle of the rotary recording cylinder 300. It is then returned to its lowered position by the mechanism described in the above patent, to allow the check to be conveyed by the belt 26 from the recording position to the storage receptacle (not shown). The stop element may be made adjustable, as also described in the above patent, to fix the position of the leading edge of the check and to accommodate different sized checks.

Fixed recording elements

As mentioned above, the code impressions applied by the differentially settable recording elements 330 may represent data which is the same for all the checks in a batch (i.e., the account number). The apparatus provides an additional group of recording elements to record further data which is relatively constant for all batches of checks coded by the particular apparatus, such as the bank number and routing symbol applicable to the particular bank coding the checks. These additional recording elements 390 are supported on a curved plate 391 extending between end plates 105 and 106 and secured thereto to rotate with the rotary cylinder 300. Curved plate 391 is formed with a plurality of longitudinal and transverse grooves defining differential positions for the recording elements 390 at the points of intersection of these grooves. The fixed recording elements 390 are each formed as a square block, shaped similarly to recording elements 330, and with a boss extension adapted to be fixed in apertures at the intersecting points of the grooves according to the required fixed differential positions. The recording elements 390 are equidistant as recording elements 330 and the sheet gripping plate 385 from the axis of rotation of cylinder 300 so that they are also on the circumference of the cylinder. In addition, the fixed recording elements 390 are positioned differentially with respect to the leading edge of the sheet gripping plate 385 to apply their record impressions to the check in their proper differential positions with respect to the leading edge of the check.

Feeding and ejecting rollers

The apparatus is provided with a pressure roller 233 which is normally in yielding contact with the feed belt 26 in order to retain the check R in contact with the belt as it is fed into recording position. As mentioned above,

when the recording elements 330 and 390 and the sheet gripping plate 385 engage the check, the check is moved in a direction opposite to that in which it was previously fed by the belt 26. It is, therefore, desirable to raise the pressure roller 233 from contact with the check at the proper time so that the check may be free for this reverse movement to preclude buckling or improper displacement of the check through contact with the pressure roller. For this purpose, referring particularly to FIG. 9, a cam 234 is fixed to shaft 18 between plates 51 and 52 of casing 11 and is provided with a high portion 234' adapted to engage a roller 239 carried by a lever 237 pivotally mounted on a rod 64. Lever 237 has a lug 240 at its opposite end adapted to engage the inner end of an arm 241 to rock the latter downwardly about a stud 243 when the high point 234' of the cam engages roller 239. Pressure roller 233 is carried by member 238 integral with arm 241 and is thereby raised out of contact with the belt upon the downward movement of this arm.

Stud 243 also has pivotally mounted thereon a bracket 238' (FIG. 1) carrying another pressure roll 233' which is normally retained in engagement with the belt 26 by its own weight. The latter pressure roller 233' is not in contact with the check during the above reverse movement thereof, and, accordingly, need not be raised with pressure roller 233. However, roller 233' can be manually raised by lifting it about its pivot 243.

To insure ejection of the record sheet from the machine after the recording operation is completed, additional pressure rollers 260 and 261 are provided at the exit side of the disclosed apparatus (FIG. 1) and are normally retained in contact with the belt 26 under their own weight. These rollers are carried by a bracket 262 pivoted at 263 so that, if it is desired to withdraw the rollers from contact with the belt, bracket 262 may likewise be swung upwardly to an elevated position.

Ink fountain

In the disclosed apparatus as mentioned above, the recording elements 330 and 390 apply their record impressions to the record sheet in the form of printed fluorescent ink markings or spots. An inking arrangement for the printing apparatus having the rotary printing member 300 is provided in the form of an ink fountain, generally designated as 400, which applies a thin and uniform film of ink to the printing elements 330 and 390 during each cycle of rotation of the recording cylinder 300.

The recording elements require only a small amount of ink during each cycle, and in fact it is necessary that the film of ink applied to these elements by the ink fountain be kept small so that the ink deposit on the record sheet will dry very quickly. Accordingly, the ink fountain is provided with a pickup roll which receives a small amount of ink from the ink reservoir and transfers only a minute amount to the distributor rolls during each cycle, which in turn transfers it to the inking roll. An oscillating arm is used as an aid in transferring this small amount of ink during each cycle from the ink reservoir to the pickup roll.

The distributor rolls and the inking roll are continuously driven while the recording apparatus is in use so that the ink received from the pickup roll will be maintained as a very thin and uniform film on these rolls. For each cycle of the recording cylinder, one of the distributing rolls is rocked into contact with the pickup roll to receive the ink therefrom. During this rocking movement, the pickup roll is indexed one increment of rotation to receive another small amount of ink from the ink supply with the aid of the oscillating member above mentioned. Another distributor roll is continuously reciprocated to evenly distribute the ink received from the pickup roll onto the surface of the inking roll, the latter transferring the ink to the recording elements.

As shown in FIGS. 2, 10 and 11, the ink fountain 400 comprises a frame 401 supported from transverse plates 50 and 51 of the casing 11 by means of a pair of upper studs 402 projecting from the frame and adapted to be inserted in slot 51' of plate 51 and a corresponding slot in plate 50 (not shown), and a pair of lower studs 403 adjustable on the frame by nuts 404 and adapted to be inserted in slot 51'' in plate 51 and a corresponding slot in plate 50. The frame consists of a pair of side members 405, each being similarly formed with a longer rear leg 405' interconnected by a cross rod 406, and a shorter front leg 405''. The frame is closed at the bottom by a trough-shaped member 407 by means of a pair of fasteners 408 passing through side members 405 into apertures 409 (FIG. 8) in the trough. The mounting studs 402 and 403 are fixed to the longer rear legs 405' of the two side members. The foregoing mounting means enables the ink fountain to be quickly and conveniently mounted between plates 50 and 51 in position to ink the recording elements of the rotary cylinder 300.

The drive for the ink fountain, shown in FIGS. 11 and 12, is taken from gear 19 which also drives the recording cylinder 300 through the power clutch as described above. It will be recalled that gear 19 is powered by the electric motor through a pulley system and is continuously driven while the apparatus is in use. With respect to the ink fountain drive, gear 19 drives a smaller gear 410 fixed to shaft 411 journaled in transverse plates 51 and 52 of casing 11. Shaft 411 carries a gear 412 fixed thereon at its end adjacent to plate 51, which gear drives a gear train comprising gear 413 on stub shaft 413' in plate 51, gear 414 on stub shaft 414' in plate 51, and gear 415 fixed to shaft 416 extending from plate 52 through plate 51. The end of shaft 416 extending through plate 51 terminates in a U-shaped member 417 adapted to straddle an arm 418 fixed to shaft 419 (FIGS. 11 and 13) of the ink fountain 400 thereby effecting a quickly detachable coupling between drive shaft 416 and shaft 419 of the ink fountain. It will thus be seen that shaft 419 can be quickly coupled to the drive means in the same simple operation of mounting the self-contained ink fountain between transverse plates 50 and 51, and that this shaft 419 will be continuously driven while the apparatus is in use.

The fluorescent ink supply I in the ink fountain (FIG. 8) is found in a reservoir defined by a metal doctor blade 420 and the pickup roll 421, so that the pickup roll has a longitudinal portion of its surface disposed for contact with the ink I in the reservoir. Blade 420 is secured to the trough-shaped member 407 and extends the full width of frame 401, and the pickup roll 421 is fixed on shaft 422 journaled through the side members 405 of the frame. The blade may be slightly spaced from, or pressed into light contact with, roll 421 by a plurality of adjustable screws 423' (FIGS. 8 and 11) projecting through the rear of trough 407 to vary the thickness of the ink coating applied to this roll as it is rotated in a manner to be described. The ink is transferred from pickup roll 421 to a distributor roll 423, thenceforth to another distributor roll 424, and then to the inking roll 425 (FIGS. 8 and 12), as will be later described. Inking roll 425 is positioned to be contacted by the recording elements 330 and 390 in the early part of the cycle of the rotary cylinder 300. A further distributor roll 426 rests on the upper surface of inking roll 425. Distributor roll 423 and inking roll 425 in the illustrated embodiment are of rubber-like material, whereas the remaining rolls 421, 424, and 426, are of steel. Thus the rolls 423 and 424 constitute a series of distributor rolls having axes parallel to the axis of the pickup roll 421 and having surfaces in mutual frictional rotational driving contact but normally well spaced from the surface of the pickup roll, while the surface of the inking roll 425 is disposed in frictional rotational driving contact with the roll 424 in the series of distributor rolls and also is disposed in inking relationship to the cylindrical printing member 300 of the printing apparatus for inking the elements 330 and 390 carried

by the rotary cylinder 300. The roll 426, driven by the inking roll 425, may be considered to be included effectively in the series of distributor rolls.

Means are provided for driving one of the distributor rolls to effect continuous rotation of all of the distributor rolls and of the inking roll during operation of the printing apparatus. Thus the rolls 423—426 are constantly driven while the apparatus is in use, whereas pickup roll 421 in contact with the ink supply is not in motion except during cycling of the rotary member 300, at which time this roll is stepped one increment of rotational movement for each cycle. As shown particularly in FIGS. 11–13, distributor roll 424 is fixed to power shaft 419 and therefore would be continuously rotated while the apparatus is in use, since this shaft is coupled to constantly rotating shaft 416. Roll 424 is normally in engagement with distributor roll 423 and inking roll 425, the latter also engaging distributor roll 426, so that these three rolls are also continuously driven while the apparatus is operating. Distributor roll 423, however, is spaced from pickup roll 421 when the former is in its normal position (see FIG. 12) so that the latter roll is not driven from roll 424 with the other rolls but rather is rotated one step during each rotary cycle of the recording cylinder 300. The means provided for rotating the pickup roll in incremental amounts, as thus determined by the operation of the printing apparatus, will now be described.

As shown in FIGS. 8, 10 and 13, distributor roll 423 is freely mounted on a fixed shaft 427 flattened at its ends and seated in an open notch 428 in the two side members of a cradle 430. The cradle is formed with an ear 431 at the upper portion of each of its sides, each ear having an adjustable screw 432 passing through an aperture therein. The cradle 430 is pivotally mounted on power shaft 419 with respect to frame 401 and is urged to its normal position of FIG. 10 by a spring 433 at each side of the cradle engaging a stud 434 thereon and a stud 435 on the frame. Thus, means are provided for rotatably mounting one of the distributor rolls 423, including the cradle 430 pivotable about an axis which is coaxial with the axis of the shaft 419 carrying the contiguous distributor roll 424. To rotate the pickup roll, the cradle 430 also carries a link 436 fixed to an arm 437 of a bell crank 438, the latter being pivoted about shaft 422 on which pickup roll 421 is fixed. Also fixed on shaft 422 is a ratchet 439 adapted to cooperate with a pawl 440 carried by the bell crank 438 and urged into engagement with the teeth of the ratchet by a spring 441 fastened to an extension of the pawl and to a stud 442 carried by the bell crank. The cradle 430 is pivoted about shaft 419 during each cycle of the recording cylinder 300 in a manner to be described, and it will be seen that, during each such pivotal movement of the cradle, bell crank 438 will be rocked clockwise about shaft 422 carrying with it pawl 440 which steps the ratchet 439 one rotational increment thereby imparting the same incremental movement to the pickup roll 421.

During this rocking movement of the cradle 430 about shaft 419, distributor roll 423 carried by the cradle is lowered into light contact with pickup roll 421. This contact between the two rolls is not sufficient to transmit the continuous rotary movement of roll 423 to roll 421, but is sufficient only to transfer the ink on the surface of roll 421 to roll 423. This contact between the two rolls can be adjusted in a manner to be described for this purpose, and it will be evident from the above that the only contact may be with the film or deposit of ink carried on the pickup roll 421 without actual contact between the roll surfaces proper.

The rocking of cradle 430 about shaft 419 also oscillates an arm 443 extending into the ink reservoir I for substantially the full width of the ink fountain, arm 443 being fastened to distributor roll shaft 427 by a pair of end brackets 444 (FIG. 8) for this purpose. The composition of the fluorescent ink supply is frequently very viscous, and this rocking movement of arm 443 tends to agitate the ink and to assist in transferring a small amount of the ink to the pickup roll 421 as it is being stepped.

Means are provided to rock the cradle 430 during each rotational cycle of the rotary recording cylinder 300. For this purpose, a hub 445 is pinned to shaft 18 (FIGS. 8 and 11) the hub having pivoted thereto one end of a link 446. The other end of link 446 is pivoted to one end of a rocker arm 447, the other end of which is fixed to a hub 448 of a rocker shaft 449 journaled through transverse plates 50, 51 of the casing 11 (FIG. 11). The rocker shaft 449 carries a pair of sleeves 451 pinned thereto, each sleeve having a pusher arm 453 in alignment with the two screws 432 threaded in the ears 431 of the cradle 430. It will thus be seen that, as the rotary member 300 is cycled, rocker arm 447 is pivoted by link 446 to rock shaft 449 carrying its pusher arms 452 into contact with the screws 432 of the ink fountain. This causes the cradle 430 to be pivoted about shaft 419 for each cycle of the rotary cylinder 300 thereby transferring the ink to distributor roll 423 from pickup roll 421 and indexing the latter roll one rotary increment, in the manner described above. Screws 432 are adjustable on ears 431 to adjust the magnitude of the pivotal movement of the cradle 430, and thereby the engagement of roll 423 with roll 421. Thus the linkage 445—449, the pusher arm 452, and the screws 432 engaged thereby constitute means, coupled to the cyclically rotatable printing cylinder 300 through its shaft 18, for rocking the cradle 430 about its axis in the shaft 419 to move the distributor roll 423 from its normally spaced relationship with the pickup roll 421 into and back out of ink-transferring relationship with the pickup roll at time intervals determined by the cyclic operation of the printing apparatus, specifically once during each rotation of the printing cylinder 300, while maintaining driving contact between the roll 423 and the contiguous distributor roll 424.

The apparatus also provides means for adjusting the inking roll 425 with respect to the rotary cylinder 300 and the recording elements 330 and 390 carried thereby. The inking roll 425 is fixed to a shaft 455 passing through elongated slots 456 in a pair of supporting members 457 connected by a cross bail 458 (FIG. 10). These supporting members 457 are pivotally mounted on shaft 419 and are adjustable by a pair of threaded studs 459 and locking nuts 460 disposed at the rear of the ink fountain. The studs pass through openings in cross rod 406 of the frame 401 and are threaded in the bail 458 of the inking roll support. Accordingly, by adjusting studs 459, the support for the inking roll 425 is pivoted about shaft 419 to adjust the position of the roll with respect to the rotary recording cylinder.

Means are also provided for raising the inking roll 425 from contact with distributor roll 424 where the apparatus is to stand idle for a long period of time. A pair of members 462 each having an operating lever 463 (FIGS. 8 and 10) are pivoted on shaft 419 at each side of the fountain between the cradle 430 and the supporting members 457 for inking roll 425. Members 462 are each provided with a cam surface 462' (FIG. 8) which bears on the extremities of shaft 455 of the inking roll passing through elongated slots 456 of the supporting members 457. Accordingly, as operating levers 463 are depressed, members 462 are rocked clockwise about shaft 419 thereby raising shaft 455 by cam surfaces 462' and lifting the inking roll 425 out of contact with the distributor roll 424. The longer rear legs 405' of the ink fountain frame 401 are each provided with a stud 465 (FIG. 8), to limit the upper position of levers 463, and with an opening 466 (FIG. 10) adapted to receive a stud 467 (FIG. 8) on each of the levers 463 to retain the latter in their lower limits.

The supporting members 457 for the inking roll 425 are also used to support distributor roll 426. The latter roll is loosely mounted on a shaft 470 having flattened ends disposed in slots in the supporting members 457, and is

tensioned against the inking roll 425 by a spring 471 fastened to each end of shaft 470 and to studs 472 carried by the supporting members (FIGS. 10 and 13).

The apparatus also provides means for reciprocating distributor roll 424 as it is being rotated in order to distribute the ink film evenly on the surface of the inking roll 425. The distributor roll 424 is reciprocated continuously while the apparatus is in use by the following mechanism illustrated in FIGS. 11 and 12. A heart-shaped cam 475 is fixed to gear 19 to rotate continuously therewith and carries on its surface a pair of cam rollers 476 of a double-armed member 477. The latter member is pivotally supported by shaft 411 and carries with it a link 478 pivoted to one arm of a bell crank 479 supported by transverse plate 52. The opposite arm of the bell crank is hinged to a sleeve 480 fixed to drive shaft 416 to which is coupled, as described above, the driven shaft 419 of the ink fountain carrying the distributor roll 424. Accordingly, the distributor roll 424 will be reciprocated continuously to evenly distribute the ink film on the inking roll 425.

Operation

Briefly summarizing the foregoing, the described apparatus operates as follows:

The settable disks 331 are first set and locked in their differential positions with respect to the sheet gripping plate 385 to represent, e.g., the account number of a batch of checks, this being done in the manner described above. Also, the fixed recording elements 390 have presumably already been fixed in their differential positions with respect to the sheet gripping plate 385 to represent, e.g., the bank number and routing symbol applicable to that particular bank. With the above recording elements set to their data-representing positions, the electric motor switch (not shown) is turned on. This causes the check feeding belt 26 to be constantly driven while the apparatus is in use, and also causes the rolls 423—426 in the ink fountain to be continuously driven. However, the rotary recording cylinder 300 is in its idle position shown in FIG. 1 as its shaft 18 is not coupled by the power clutch mechanism to drive gear 19. Also, the pickup roll 421 in the ink fountain is idle, and the distributor roll 423 is in its non-transferring position with respect thereto, as shown diagrammatically in FIG. 12.

A plurality of checks, comprising a batch, are then each individually fed by the belt 26 between the frame 10 and casing 11 of the recording apparatus. As a check moves into position between the recording cylinder 300 and the platen 29, it raises roller 58 to engage lug 84 of the clutch mechanism with clutch member 85 and also to raise the stop element 224. The engagement of the clutch mechanism initiates a cycle of rotation of the rotary recording cylinder 300, and the raising of stop element 224 positions the leading edge of the check the required predetermined distance from the sheet gripping plate 385 of the cylinder when the check is first engaged thereby at the beginning of the recording action (FIG. 9).

As the rotary cylinder 300 begins to cycle (clockwise) the cradle 430 of the ink fountain 400 is rocked (clockwise) through the mechanism including elements 446—452 engaging the threaded studs 432 of the cradle. The rocking of the cradle lowers the distributor roll 423 into contact with the pickup roll 421 of the ink fountain to thereby transfer to the former roll a small amount of ink adhering to the surface of the latter roll. This rocking movement of the cradle also steps the pickup roll 421 one increment of rotation through the pawl and ratchet mechanism 439, 440, as described above, and also rocks the agitator blade 443 into the ink reservoir. The ink transferred to roll 423 is thoroughly and evenly distributed over the surface of inking roll 425, and as the recording cylinder 300 is rotated, a small amount of ink is transferred from the inking roll 425 to the printing surfaces of the rotary printing member 300 of the printing apparatus, that is, to the recording type elements 330 and 390.

The rotary cylinder 300 continues to cycle until its sheet gripping plate 385 contacts the check (as shown in FIG. 9), at which time it is at the required predetermined distance from the leading edge of the check as determined by the stop element 224. The recording cylinder makes rolling contact with the check, thereby transferring the ink coating on the recording elements as markings, or spots, thereon in their proper differential positions with respect to the leading adge of the check, at the same time moving the check reversely from its direction of feed by the belts 26. The reverse movement of the check is permitted by roller 233 having been raised through the action of cam 234 (FIG. 9).

As the recording cylinder 300 completes its cycle, the gripping plate 385 releases the check, roller 233 returns into contact with the check thus restoring the original direction of feed of the check by the belt, stop element 224 returns to its lower position permitting the check to be fed into the discharge receptacle (not shown), and the clutch disengages completing the cycle of rotation of the recording cylinder 300.

As the succeeding check is fed by the belt into recording position between the rotary cylinder 300 and the platen 29, it initiates another cycle of operation in the manner described above.

FIG. 15 illustrates a record sheet R having the fluorescent markings M impressed thereon in their differential positions corresponding to the positions of the settable and fixed recording elements 330 and 390 respectively, of the recording cylinder 300 illustrated in FIG. 14. With the cylinder being driven clockwise (in the direction of the arrow of FIG. 14 as seen from the top of the cylinder), and the record sheet being moved thereby in the direction of the arrow of FIG. 15, it will be seen that the sheet gripping plate 385 will first engage the check on the dotted line R_C (which will be the required predetermined distance from the leading edge R_L of the check), and that the settable elements 330 will first apply their impressions 330M and then the fixed elements 390 will apply their impressions 390M as the check is moved in the direction of the arrow. The record impressions 390M applied by the fixed recording elements 390 will therefore be closest to the leading edge R_L (serving as the reference on the record sheet) taken as the sheet is fed by the belts through the machine. Another dotted line in FIG. 15 separates the zone containing these record impressions 390M and the zone containing the record impressions 330M applied by the settable recording elements 330. These record impressions (and their respective recording elements) are, of course, identical to each other in form, differing only in position, and are distinguished by vertical and horizontal dotted lines in these figures merely for clarification purposes. The bare zone at the left of the record can be used to contain other coded information, such as the amount of the check in coded form.

The foregoing apparatus has been described as representing what is presently considered to be a preferred embodiment of the invention. Further applications, variations, and modifications of the disclosed apparatus will be apparent to those skilled in the art coming within the spirit and scope of the invention as defined in the following claim.

What is claimed is:

Printing apparatus, comprising: a rotary printing member having peripheral printing elements; means for driving said rotary printing member through separate rotational printing cycles and for initiating a printing cycle; an ink reservoir; a pickup roll disposed for contact of a longitudinal portion of its periphery with ink in the reservoir; means for rotating said pickup roll by an incremental amount during each rotational printing cycle only; a doctor blade disposed adjacent to the periphery of said pickup roll for regulating the thickness of ink carried by the pickup roll after contact thereof with ink in the reservoir; a series of distributor rolls having axes parallel to

the axis of said pickup roll and having surfaces in mutual frictional rotational driving contact but spaced from the surface of the pickup roll; means for rotatably mounting one of said series of distributor rolls, including a cradle pivotable about an axis coaxial with the axis of a contiguous distributor roll; means coupled to said cyclically rotatable printing member for rocking said cradle about said axis during each rotational printing cycle to move, once during each rotation of said printing member, said one distributor roll from its spaced relationship with said pickup roll through an adjustable pivotal throw into and back out of ink-transferring relationship with a portion of the periphery of said pickup roll which carries a thickness of ink regulated by the rotation thereof in said incremental amounts and by said doctor blade, while maintaining driving contact between said one distributor roll and said distributor roll contiguous thereto; an inking roll the surface of which is disposed in frictional rotational driving contact with a roll in said series of distributor rolls and also is disposed in rotational inking relationship to the peripheral printing elements of said rotary printing member; and means for driving a roll in said series of distributor rolls to effect continuous rotation of all of the distributor rolls and of the inking roll during operation of the printing apparatus.

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