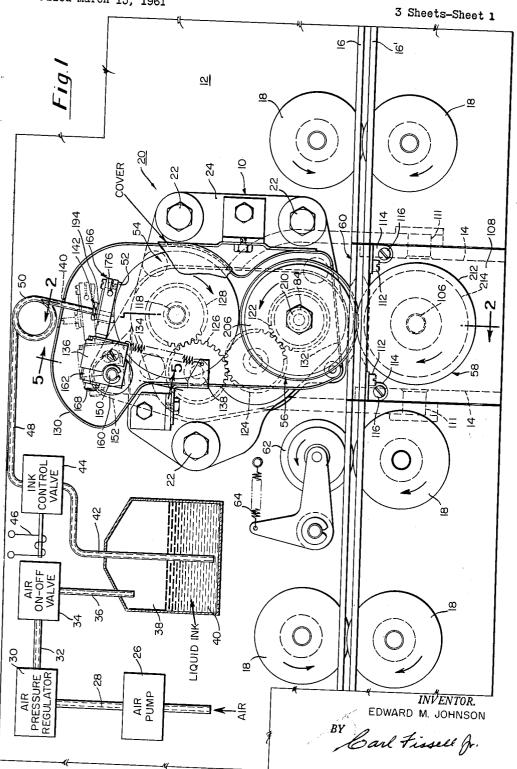


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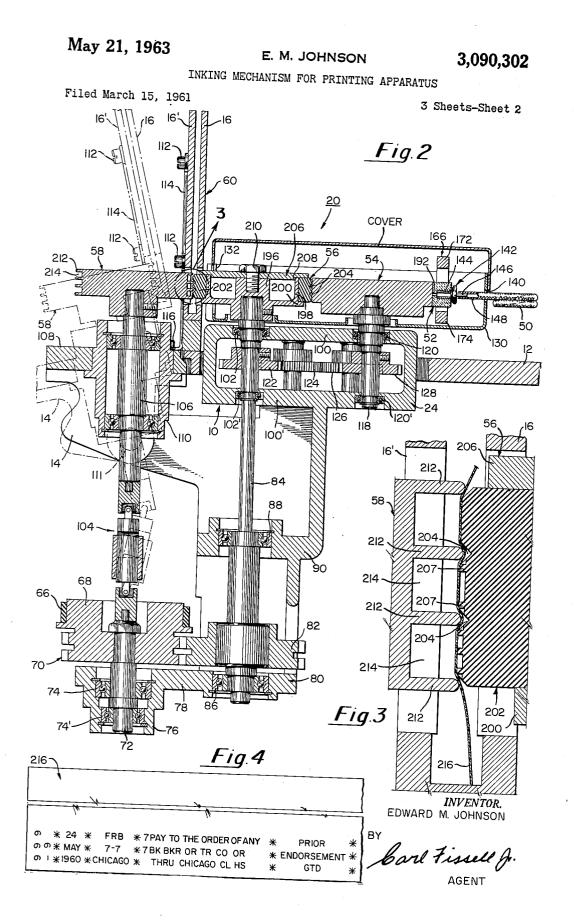
3,090,302 INKING MECHANISM FOR PRINTING APPARATUS

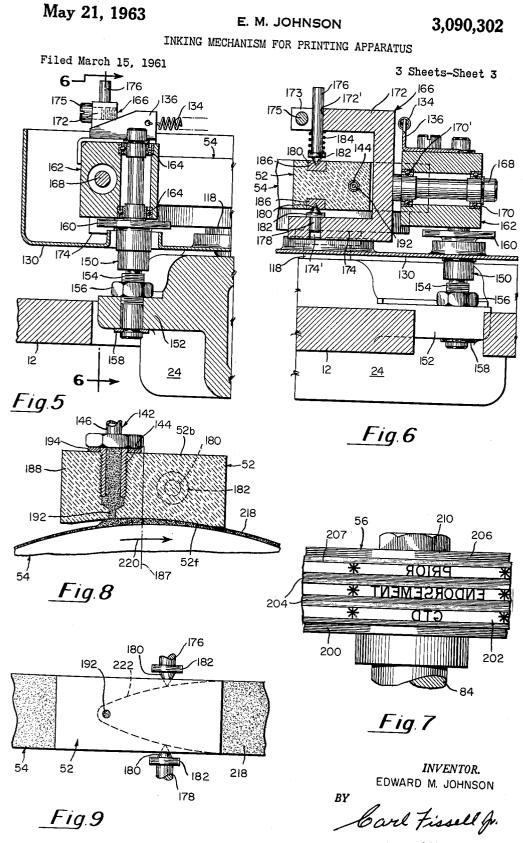
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3,090,302 INKING MECHANISM FOR PRINTING APPARATUS

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The present invention relates broadly to a device for 10 marking on sheet items moving at high speed, and more particularly to rotary printing apparatus having elements thereon adapted to print upon relatively thin items such as paper checks or documents in a manner to impart the print in a line across one surface of the item as part of 15 a continuous movement of the item. With still more particularity, the invention has to do with the distribution of the printing ink under pressure from an inking member to an ink transfer mechanism and to means providing adequate and uniform flow of the ink to the surface of 20 the print bearing portion of the apparatus. With even greater particularity, the present invention has to do with an improved inking member for use with an item or document indorser which latter mechanism may be employed in a high speed item sorter operating at a nominal speed 25 of approximately 400" per second and wherein the items are indorsed on the "fly," i.e., the indorsement is placed on the body of the item without stopping the same.

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It is an important object of the present invention to provide an improved high speed printing apparatus. 30

It is another object of the present invention to provide an improved inking mechanism for high speed printing apparatus.

A further object of the present invention is to provide an inking mechanism in which ink is supplied under pres-35 sure through an air floated or flying inking member disposed adjacent the surface of the printing apparatus.

An additional object of the invention is to provide an improved inking system in which ink is supplied under pressure from an arcuate face of a flying ink shoe disposed 40 with its arcuate face in confronting relation to the peripheral surface of a printing wheel.

In accordance with the foregoing objects and first briefly described the present invention comprises printing-indorsing apparatus including an ink distributing member dis-45posed in air bearing relation to a rotatable ink transfer member, the latter being operatively interposed between the ink distributing member and in driving engagement with an indicia bearing member. A grooved rotatable back up member operatively associated with the indicia bearing member is adapted when rotated to entrain and move an item therebetween whereby a printed impression of the indicia is caused to be made on the item.

With the foregoing and other objects in view, which will appear as the description proceeds, invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that various changes in form, proportion and minor details of construction may be made within the scope of the claims without departing from the 60 spirit or sacrificing any advantages of the invention.

For a complete disclosure of the invention, a detailed description thereof will now be given in connection with the accompanying drawings forming a part of the specification wherein:

FIG. 1 is a top plan view of the present invention incorporated in a check sorting environment;

FIG. 2 is a side elevational view along the line 2of FIG. 1 illustrating the manner in which the indorsing apparatus can be partially exposed to view for main-70 tenance:

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FIG. 3 is a detail view of the area enclosed by the broken line 3-3 of FIG. 2;

FIG. 4 is a view of an item such as a check including the indorsement provided by the present apparatus;

FIG. 5 is a sectional view of the inking shoe member taken along the line 5-5 of FIG. 1;

FIG. 6 is a view along the line 6-6 of FIG. 5;

FIG. 7 is an enlarged detail view of a portion of the print wheel of the present apparatus;

FIG. 8 is a greatly enlarged view of the inking shoe and a portion of the transfer roller used therewith; and, FIG. 9 is a greatly enlarged elevational view of a portion of the ink transfer roller illustrating the ink pattern in dotted outline thereon.

Referring to the drawings in which similar reference characters designate a corresponding part, there is depicted, as environment only for the present invention, a portion of a high speed electronic sorting apparatus 10, such for example, as the apparatus shown and described in the copending application, Serial No. 816,005, filed May 26, 1959, now U.S. Patent No. 3,022,907, in the name of Felice V. Palasciano, for an "Item Handling Apparatus," and assigned to the same assignee as the present invention. The present invention is best seen in FIGS. 1 and 2, and, as incorporated in a sorter, includes a frame member 12, having side portions 14 which support in a known fashion a pair of vertically, projecting, parallel, spaced apart, discontinuous guideways or chute forming members 16-16' through which the items such as checks or documents to be sorted are passed by means of drive rollers 18 and other suitable well known driving equipment, not shown. The drive rollers 18 which are of the overlapping "knuckle roller" type may project into and through apertures not shown, in member 16-16', to engage and move the items.

The assembly 20, which includes the present invention, is adapted to be removably disposed within the framework of the base machine and is mounted thereto by means of the mounting bolts 22 which project through a sub-assembly which in the present embodiment consists of a casting 24, the latter member being detachably engageable with the remainder of the sorter assembly in a known fashion, although not shown herein. The foregoing arrangement permits convenient application of the invention thereto although it is to be understood of course, that the invetnion may be applied to other mechanisms. The present apparatus is a unitized sub-assembly and consists of a number of demountable parts, the operation and employment of which will be described in detail hereinafter.

As seen most clearly in FIG. 1, and as illustrated by means of the schematic block diagram arrangement (upper left, FIG. 1) fluid such as air under pressure from an air pump 26 is fed via tubing 28 to fluid pressure regula-55tor 30 which regulates its further flow through tubing 32 to an air control "on-off" valve 34. The air under suitable and predetermined pressure is forced via tubing 36 into reservoir 38 containing liquid ink 40 of suitable viscosity and volatility for quick drying from whence it is fed via tubing 42 to an ink control valve 44 which through solenoid 45, meters the ink to the shoe 52 during the printing operation hereinafter described. The solenoid 46 may be controlled by the application thereto of a D.-C. level voltage from the operate clutch (not shown) of the 65 item feeder, also not shown, of the base machine. Thus, each time the item feeder clutch means causes an item or items to feed through the sorter and thus through the guideway 16-16', the solenoid 45 will be energized and/ or held "on." From the metering valve 44 the pressurized ink is fed through a flexible plastic tubing 43 which is curled once about itself as indicated by reference character 50, thence to the indorser apparatus 10. The indorser 10 generally includes an inking member or shoe 52 which is mounted or suspended in air bearing relationship adjacent the surface of an ink transfer member 54, which, as shown in the present preferred embodiment comprises a $\mathbf{5}$ rotatable, metallic roller having a flat, smooth, peripheral surface. The ink transfer wheel 54 is adapted to be rotated against the confronting peripheral surface of a print wheel 56, the construction of which will be set forth hereinafter. Print wheel 56 carries, in suitable fashion, a detachable, 10 removable print font of characters including the particular print material which it is desired to be indorsed on items being sorted. The print wheel 56 is rotatably engageable with a backup member 58 also in the form of a roller. The surface of the latter member 58 includes 15 means hereinafter described, which partially overlap portions of the print wheel 56, whereby as items pass therebetween they are entrained and driven by the print wheel and the backup roller 58. The passage of the items is from left to right, as viewed in FIG. 1. However, the 20 direction of the item movement is immaterial.

The indorser apparatus, as shown in FIG. 1, includes a sub-assembly of which the corrugated backup wheel 58 is a movable part and which is arcuately retractable, as shown more particularly in FIG. 2, to carry with it the 25 central portion 60 of the guideway 16—16', together with the backup wheel 58, leftwardly from its full line position to its broken line position, thereby exposing the print wheel 56 to view. This type of structure provides simple, inexpensive and efficient means for servicing or changing 30 the print wheel and type font. It also permits repair and maintenance to be performed simply and easily on the type carrying member.

Disposed along the item pathway 16—16' are a series of pressure rollers 62 only one being shown in FIG. 1, 35 which are biased by means of springs 64 toward the drive rollers 18 on the opposite side of the guideway. The items are adapted to be moved through the guideway by means of an endless belt, not shown, in conjunction with the rollers 18 and are moved therealong in the present 40 application at a speed of approximately 400" per second.

Referring to FIG. 2, a source of power for supplying rotative torque for indorser 10 as well as the other apparatus in the drive train, may be continuosuly supplied by a motor, not shown, through a belt 66 and pulley hub 45 68 of gear 70 which is keyed to stub shaft 72. Bearings 74-74' positioned along the length of the stub shaft 72 journal the latter for rotation in a sleeve housing 76 depending below the base plate 78 of a gear casing 80. Companion gear 82 meshes with gear 70 and is suitably keyed to shaft 84 rising vertically and carrying on its forward or upward end the print wheel 56. The lower end of the shaft is journalled for rotation in base plate 78 by means of the bearing 86 and bearing 88 located in the bracket 90 depending from the gear casting 24. The upper portion of shaft 84 to which the print wheel 56 is keyed is journalled for rotation in the horizontal portions 100-100' of the casting 24 by means of bearings 102-102', as shown.

A universal joint or coupling 104 connects the aforementioned stub shaft 72 to shaft 106 which carries the drive roller 58 for joint rotation therewith. It is observed that shaft 106 is journalled in a plate 108 by a sleeve 110 press-fitted or otherwise disposed thereon. Plate 108 lies in the same general plane as plate 12 but is not connected 65 thereto for purposes of readily separating the same. The discontinuous portion 60 of guideway 16—16' is vertically supported and secured, as by bolts 112, to a vertically projecting member 114 attached at its lowermost extremity by fastening means 116 to the upper surface portion 70 of plate 108.

Universal coupling 104 is, as beforementioned, pivotally connected at its opposite ends to shafts 72 and 106 and is axially extensible and retractable by the provision of an internal slide key, thus to permit movement of guide plate 75

section 60 and plate 108 about pivot 111 relative to plate 12 and print wheel 56. Driving connection is maintained between the two shafts even though they assume angularly relative positions, as shown by the comparison of the full and broken line positions of the coupling.

As seen in FIGS. 1 and 2, the casting 24 houses a gear train by means of which rotative power or torque is transmitted from the print roller drive shaft 84 through intermediate gearing to the ink wheel drive shaft 118 journalled in bearings 126—120', whereby the inking wheel 54 may be rotated in a direction so as to cause ink to be removed from the inking shoe 52 and applied to the printing characters or indicia of the print wheel 56. The gear train generally includes gears 122, 124, 126, and 128. Gear 128 being pinned or made fast on shaft 118 and driving the same.

Surrounding the inking member, the inking wheel and the print wheel is a splash guard 130—of irregular shape and generally discontinuous in the area of the back-up wheel so that the print wheel may project through an opening 132 therein, FIG. 2, and into operative relationship with the back-up wheel. The splash guard is or may be provided with a cover and acts to prevent splatter of the ink as a result of the high speed operation of the indorser, on the order of 400" per second. The inking member 52 is urged by means of a spring 134, FIGS. 1, 5 and 6, toward the ink transfer wheel 54. The spring is attached at one end to a projection 136, on the shoe structure 52 and at its opposite end to a tab 138 projecting over the ink transfer wheel 54.

The flexible tubing 48 is fed through a slot 149 in the guard 130 and is attached to the inking member 52 by means of a fitting 142 threadedly engaged in bore 144 of the inking member. The opposite end 146 of the fitting is press-fitted into the end 148 of the flexible tubing. The tubing is provided with a single twist or turn as beforementioned leading onto the inking shoe in order to provide a certain amount of "play" in this member, thus avoiding accidental constriction of the tubing during the "flying or floating" operation thereof or when the inking shoe is moved or retracted from its full to its broken line position, FIG. 1.

Referring to FIGS. 5 through 9, wherein the details of the inking shoe and its cooperating structures are illustrated, there is shown a pivot shaft 150, mounted relative to a projecting portion 152 of the casting 24 by means of a threaded shank 154, the hexagonal nut 156, and the C-ring 158. The shaft 150 is disposed to pro-

ject vertically and carries intermediate its ends an en-50 larged annular portion 160 which may act to prevent ink transfer through the splash guard 130. A pivot block 162 is mounted over the pivot shaft 150 and is journalled therein by means of bearings 164—164. Pivot block 162 also carries a substantially U-shaped inking 55 shoe, yoke member 166, FIG 6, the horizontally ex-

tending stub shaft portion 168 of which is rotatably journalled therein by means of bearings 170—170. The yoke structure 166 includes forwardly projecting parallel spaced apart arms 172 and 174. Each of the parallel

- 0 arms is drilled or otherwise provided with openings 172'-174' respectively, to receive oppositely disposed pivot pins 176 and 178 which project into and through a respective arm a short distance. The projecting portion of each pivot pin is provided with a conical shaped
- 65 bearing end 180 adjacent a shoulder portion 182, for purposes to be described hereinafter. Pivot pin 176 is slightly longer than the other pin and is adjustably spring loaded by means of a spring 184 which rests against the forwarded shoulder portion 182 and abuts the inside 70 portion of the arm 172. Arm 172 is slotted as indicated by reference character 173, FIGS. 1 and 6, and is further provided with a screw 175 threadedly extending therethrough permitting the pin 176 to be slidably adjustable relative to the shoe 52.

The inking shoe 52 of the present apparatus provides

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means for applying a thin even film of ink to the inking wheel 54 and comprises a substantially rectangular block or body of relatively hard, high abrasion resistant, relatively non-porous material, such for example, as solid carbon. Oppositely disposed recesses are provided in 5 shoe 52 into which bearing members 186-186 are secured as by being press-fitted thereto for the reception thereagainst of the conical pivot pin end portions 189-180. The recesses are off-set slightly relative to the center line 187 of the block 52, as seen most clearly in FIG. 8, 10 for purposes which will become clear hereinafter. The portion 188 extending away from the pivots (to the left in FIG. 8) is provided with an ink receiving, threaded aperture 144, the major extent of which is considerably larger in diameter than the orifice 192 which opens 15 outwardly away therefrom. The off center location of the orifice 192 and the separation of the orifice from the proximity of the pivot pins 180 makes for proper and adequate dispersal of the ink from the orifice onto the inking wheel, as is further considered hereinafter. The 20 block 52 is provided with an arcuate face portion 52fadjacent the opening 192, the radius of curvature of which corresponds substantially to the radius of curvature of the peripheral surface of the inking wheel 54.

The flexible tube connecting member 142 is received 25 within the enlarged threaded opening 144 in the back portion 52b of the inking member 52 and is provided with a flexible O-ring 194, of rubber or other similar material, FIGS. 1 and 8, to seal the tube to the inking member. The ink delivering tube 48 as earlier men- 30 tioned herein, may of course be of any suitable material, such as any of the plastic materials used for liquids and which do not react chemically with the liquid or contaminate it, or which are not eroded or otherwise chemically injured or destroyed by the ink. 35

From the foregoing it is seen that the inking member or shoe 52 is, by the arrangement hereinbefore set forth, freely suspended for movement in at least two directions perpendicular to each other about the main pivotal axis or pivot member 150 which is attached to the sub-frame 40 or casting 24. This "gimbal" arrangement permits the shoe 52 to float or fly on the air film generated by relative movement between the transfer wheel and the shoe when the wheel is rotated. The hose connection to the shoe has little, if any, effect on the gimbal and being 45flexible prevents loading of the gimbal suspension. The enlarged counterbore in the inking shoe directly behind the orifice 192 provides a small ink reservoir back of the arcuate surface 52f of the shoe itself.

Referring now particularly to FIGS. 2, 3, and 7 of the 50 drawings, it is seen that the print wheel 56 of the present invention comprises a rotatable cylindrical member having a central mounting hub 196 and an outer peripheral vertical rim portion 198 including an annular shoulder or ledge 200. A flexible, resilient annular member 202 55 which is provided with a plurality of circular grooves 204, FIGS. 3 and 7, is employed therewith and carries a type font of intelligible indicia 207 therearound forming the print element. This member may be made of certain of the well known plastic materials which are not 60 attacked by the chemical solvents in the ink and may, for example, be of neoprene. The type characters or font may be provided as by casting or molding techniques and in such manner and resultant configuration that each row of information indicia 207 is separated 65 from the next adjacent row by a groove 204, as shown clearly in FIG. 3. The member 202 is adapted to be press-fitted to the vertical rim portion 198 of wheel 56 and to rest against the ledge 200. An annular cap or 70 cover member 205 having a flange 203 abutting the member 202 is secured to the hub 196 by a bolt 210 and in this manner provides means for retaining the member 202 on the print wheel 56. The foregoing ar-

and maintenance of the print wheel and type font thus increasing the efficiency of the apparatus and avoiding lengthy and costly "down time" for changes in type format, etc.

Of particular importance in the present application is the construction and configuration of the backup wheel 58 which is designed in the nature of a "knuckle roller" having a plurality of peripheral lands 212 and grooves 214 thereon. This construction permits a more desirable indorsing-printing operation than was heretofore available. Since the items are fed asynchronously, that is on a discontinuous time base, the present construction avoids off-set printing i.e., printing against the backup rollers and thereafter having that printing transferred to the face of the item or document.

The land and groove arrangement of the knuckle roller 58 is shown more particularly in FIG. 3 wherein the item 216, to be printed upon, is illustrated as being entrained between the knuckle roller 58 and the print wheel 55. The rim or forward portions of the knuckles or lands 212 extend slightly into the grooves 204 in the print wheel member 202 and when an item 216 is disposed therebetween produces sufficient pressure so that a proper printing is accomplished, while the tolerances are such that when there is no item entrained between the knuckle roller 58 and the print wheel 56 no off-set printing can take place therebetween since the print makes no contact with roller 58.

As seen in FIG. 3, the knuckle roller configuration forces the item 216 to take an accordion or pleated shape and the printing is accomplished against the paper. However, there is enough mass to the paper to afford a good printing transfer by deforming the item itself. In the preferred and illustrated embodiment the backup roller 53 is less hard than the print on the wheel $5\hat{6}$, so if for example, a staple were to come through on an item the staple might shear off the type faces but the entire apparatus would flex or give slightly avoiding any large scale damage to the rotating portions of the mechanism.

As seen most clearly in FIGS. 4 and 7, the indorsement or whatever printing is required is produced in a three-line run. However, it is to be noted that various combinations of lines of type could be employed with the present apparatus. All that would be necessary to change the type lines or their number would be to change the type font and/or the width of the print wheel. The apparatus has been designed in the present instance to accept three lines of type. However, five or seven or any reasonable number of lines of type could be employed.

In operation of the present invention the air pressure regulator 30 permits a predetermined pressure and volume of air, e.g., approximately five pounds per square inch, from pump 26, to be introduced through the line 32 to the air "on-off" valve 34 and into the reservoir. The pressure build-up is sufficient to force ink from the reservoir through the control valve 46 into the entering pipe 48 connected to the back of the inking shoe 52. At such time as the ink transfer wheel 54 is brought up to speed the shoe 52 will "fly" or "float" in air bearing relation to the wheel 54. A layer 218 of ink, FIGS. 8 and 9 is forced out of the shoe to be spread around and be deposited on the peripheral surface of wheel 54 due to the relative movement of the inking wheel in the direction or arrow 220 and the pressure behind the ink orifice 192. This combination of forces lifts the shoe 52 off the inking wheel 54 so it rides on a relatively thin film of air and ink, as shown. As seen at the left of FIG. 8 the ink film 218 is relatively thin after contact with the print wheel 56.

The carbon shoe 52 is somewhat porous and the arcuate face 52/ becomes slightly impregnated with ink so that in a manner of speaking, the ink acts as a lubricant. rangement permits efficient change, alterations, removal 75 The gimbal mounted shoe actually "flies" on a hydrodynamic film-a mixture of ink and air. This type of shoe suspension including the flexible tubing coil 50 permits the shoe to follow very closely the surface of the ink transfer wheel 54 and thus comply with any "run out" in wheel 56 while operating on an extremely thin film 5 of ink. The ink pattern 222, FIG. 9 is somewhat like a portion of an ellipse or elongated tear drop shape and is seen to spread out away from the orifice 192, rightwardly in FIGS. 8 and 9. The location of the orifice offset from the pivots 186-186 minimizes ink over spray and 10 side flow relative to wheel 54.

The present inking mechanism may be adapted for two conditions. One is a standby condition and the other is a print condition. The ink is turned "on" and "off" by means of the solenoid actuated valve which is adapted 15 to be controlled from a source of D.C. voltage, not shown, in definite time sequence as earlier described, or it may be operated by hand. Thus while the base machine, e.g., a sorter, is actually feeding items therethrough, the inker indorser arrangement is in operation and ink would be 20 supplied to the shoe 52 during this time. In the standby condition, i.e., when there are no items coming through the sorter, the ink flow is shut-off. The shoe does not move into and against the steel inking drum 54 and wear or abrade it since it floats on an air bearing as be- 25 forementioned. The inking shoe acts in effect as a combination of a hydrostatic and hydrodynamic type of apparatus. The use of carbon for the shoe body affords an important characteristic to the operation of the apparatus, e.g., during the brief period of time during start- 30 ing when the shoe is actually in momentary contact with the drum the carbon gives excellent wear characteristics. With the foregoing printing on the items can be made lighter or darker by lowering or raising the air pressure in the ink reservoir.

What is claimed is:

1. Printing apparatus comprising, an ink distributing member having an exposed surface portion thereon, means mounting said ink distributing member for fluid floating rock and roll movement about two axes at right 40 angles to each other, an indicia bearing member capable of producing an impression therefrom, means for rotating said indicia bearing member, means for transferring ink from the exposed surface of said ink distributing member to the surface of said indicia bearing member, 45 and, means operatively associated with said indicia bearing member for entraining and moving a sheet item therebetween so as to produce a printed impression thereupon when said items are fed thereto.

2. Printing apparatus comprising, an ink distributing 50 member having an exposed arcuately shaped surface portion thereon, means mounting said ink distributing member for fluid floating rock and roll movement about two axes at right angles to each other, an indicia bearing member capable of producing printed impressions there- 55 from, drive means for said indicia bearing member, means intermediate said ink distributing member and said indicia bearing member for transferring ink from the arcuate surface portion of said ink distributing member to the surface of said indicia bearing member so as to wet the 60 latter with ink, and, means operably associated with said indicia bearing member for entraining an item to be printed upon therebetween whereby an impression of the indicia on said indicia bearing member is transferred to the said item when said item is moved therepast. 65

3. Printing apparatus comprising, an ink distributing member having an exposed arcuate surface portion thereon, said member being mounted for fluid floating movement in a plurality of directions about two axes disposed at right angles to each other, said distributing mem- 70 ber being provided with an enlarged ink receiving opening therein and including an orifice leading from said opening to said exposed arcuate surface portion thereof, an indicia bearing member including a removable type element for producing a printed impression therefrom, 75

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means disposed intermediate said ink distributing member and said indicia bearing member for transferring ink from the exposed surface of said ink distributing member to said indicia bearing member so as to wet the type with ink, and, means operably associated with said indicia bearing member and movable conjointly therewith for gripping and moving an item to be printed upon therebetween whereby an ink impression of the type on said indicia bearing member is transferred to said item.

4. Printing apparatus comprising, an ink distributing member having an exposed arcuate surface portion thereon, means mounting said member for fluid floating movement about two axes in a plurality of directions at right angles to each other, a rotatable type carrying member, a demountable removable type bearing element operably engageable with and receivable over said type carrying member, said type bearing element including a plurality of lands and grooves thereon with the type disposed on said lands, means intermediate said ink distributing member and said type carrying member for transferring ink from the exposed surface of said ink distributing member to said type bearing element so as to wet the latter with ink, and, means operably associated with said type carrying member and movable conjointly therewith, said last mentioned means including a plurality of annular elements thereon for reception within the grooves between said type thus to grip and entrain an item therebetween whereby when said type carrying member is rotated an impression of the type is transferred to said item as said item is moved thereby.

5. Printing apparatus comprising, a gimbal mounted ink distributing shoe having an exposed arcuate surface portion thereon, said shoe being mounted for movement in a plurality of directions about two axes at right angles to each other, a rotatable print wheel, a demountable resilient annular member receivable over the peripheral surface portion of said print wheel, said annular member including a plurality of rows of type disposed thereon in lines, each line of type being separated from an adjacent line of type by an annular groove opening outwardly from said member, an ink transfer wheel disposed intermediate said ink distributing shoe and said print wheel for transferring ink from the exposed arcuate surface portion of said ink distributing shoe to the faces of the type on said annular type member, and, a roller operably juxtaposed to said type bearing member and movable conjointly therewith, said roller being provided with a plurality of lands and grooves thereon and operably associated with said type bearing member such that the lands of the former are received within the grooves of the latter whereby when said type bearing member is rotated an item may be entrained and moved between said type bearing member and said rotatable roller so as to provide an impression of the type on said annular member onto said item as said item is moved therebetween.

6. The invention according to claim 5 wherein said ink distributing shoe comprises a solid rectangular block of carbonaceous material including said arcuate surface portion, said block being provided with an aperture therethrough and including a threaded portion connectable to an ink reservoir, said aperture being disposed in said block slightly off-set from a center line through the long dimension of said block.

7. Printing apparatus comprising, an ink reservoir, a source of air pressure for said ink reservoir, a gimbal mounted ink distributing member having an exposed arcuate surface portion thereon, said ink distributing member being provided with an orifice extending therethrough and opening outwardly to said arcuate surface portion, flexible means for supplying ink under pressure from said reservoir to said orifice in said distributing member, control means operably associated with said reservoir and operable to meter the ink from said reservoir to said ink

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distributing member, an indicia bearing member, means intermediate said ink distributing member and said indicia bearing member for transferring ink from the exposed arcuate surface portion of said ink distributing member to said indicia bearing member, and, means op-5 erably associated with said indicia bearing member and movable thereby for entraining and moving an item to be printed upon therebetween whereby an impression of the indicia on said indicia bearing member is transferred to said item. 10

8. Printing apparatus comprising, a printing wheel having indicia forming elements about its periphery, an ink transfer wheel rotatably mounted adjacent said ink transfer wheel with its periphery engaging the periphery of said printing wheel, means for rotating said ink trans- 15 fer wheel and said printing wheel simultaneously, an inking shoe having an arcuate surface substantially conforming to the peripheral curvature of said transfer wheel, means mounting said inking shoe for movement about two axes perpendicular to one another with its 20 arcuate surface closely adjacent the periphery of said transfer wheel and in fluid bearing relationship thereto, means resiliently biasing said inking shoe toward said transfer wheel, means to feed ink under pressure into the space between said arcuate surface of said inking shoe 25 and said ink transfer wheel thus to provide a fluid bearing combining with said resilient means to support said inking shoe in flight closely adjacent to said transfer wheel and in a manner to effect a spreading of the ink evenly over the peripheral surface of said transfer wheel 30 from which it is transferred to said indicia forming elements on the periphery of said printing wheel during rotation thereof, and means to feed items to be printed past and in contact with said indicia forming elements 35 in a manner to print said indicia upon said items.

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9. Printing apparatus comprising, a gimbal mounted ink distributing member having an exposed surface portion thereon and being capable of moving in fluid floating condition in at least two directions at right angles to each other, an indicia bearing member capable of providing printed impressions therefrom, means for transferring ink from the exposed surface of said ink distributing member to the surface of said indicia bearing member so as to wet the latter with ink, means biasing said gimbal mounting in a manner urging said ink dis-45 tributing member toward said ink transferring means whereby its exposed surface is in contact therewith, means for injecting ink under pressure between said ink distributing member and the said surface of the ink transferring member to move said ink distributing member 50 away from said ink transferring member with its said surface in a flying condition on a fluid film generated conjointly by the rotation of said ink transferring member and the injection of ink between the ink distributing means and the ink transferring member, and, means en-55 gageable with said indicia bearing member and movable thereby for entraining and moving an item therebetween so as to produce a printed impression on said item from said indicia bearing member.

10. Printing apparatus comprising, a printing wheel having indicia forming elements about its periphery in axially spaced rows, and grooves between said rows of indicia, an ink transfer wheel rotatably mounted with its periphery engaging the periphery of said printing wheel, 65 means for rotating said ink transfer wheel and said printing wheel simultaneously, an inking shoe having an arcuate surface substantially conforming to the peripheral curvature of said transfer wheel, means mounting said inking shoe with its arcuate surface closely adjacent the periphery of said transfer wheel for movement about two axes perpendicular to one another in fluid bearing relation to said wheel, means resiliently biasing said inking shoe toward said transfer wheel, means to feed ink

face of said inking shoe and said ink transfer wheel thus to provide a fluid bearing combining with said resilient means to maintain said shoe in flight closely adjacent to said transfer wheel and to cause the ink to spread evenly over the peripheral surface of said ink transfer wheel from which it is transferred to said indicia forming elements on the periphery of said printing wheel during rotation thereof, and means to feed items to be printed past and in contact with said indicia forming elements in a manner to print said indicia upon said items, said last means including a back-up wheel having peripheral flanges in contact with the periphery of said printing wheel in said grooves only thereby to prevent ink from being transferred to said back-up wheel.

11. Printing apparatus comprising, a gimbal mounted ink distributing member having an exposed surface portion thereon and being capable of moving in fluid floating condition in at least two directions at right angles to each other, an indicia bearing member capable of providing printed impressions therefrom, means for transferring ink from the exposed surface of said ink distributing member to the surface of said indicia bearing member so as to wet the latter with ink, means biasing said gimbal mounting in a manner urging said ink distributing member toward contact with said ink transferring means, means for injecting ink under pressure between said ink distributing member and said ink transferring member to maintain said ink distributing member in a flying condition on a fluid film generated conjointly by the rotation of said ink transferring member and the injection of ink between the ink distributing means and the ink transferring member, and, means engageable with said indicia bearing member and movable thereby for entraining and moving an item therebetween so as to produce a printed impression on said item from said indicia bearing member.

12. Printing apparatus comprising, means forming a discontinuous pathway for sheet items, an ink reservoir, a source of air pressure for said ink reservoir, means for regulating said air pressure to said reservoir, a gimbal mounted ink distributing member having an exposed arcuate surface portion thereon, said ink distributing member being provided with an orifice extending therethrough and opening outwardly to said arcuate surface portion, flexible means for supplying ink under pressure from said reservoir to said orifice in said distributing member, electromagnetic control means operably associated with said reservoir and operable to meter the ink from said reservoir through said flexible means to said ink distributing member, an indicia bearing member, means intermediate said ink distributing member and said indicia bearing member for transferring ink from the exposed arcuate surface portion of said ink distributing member to said indicia bearing member, means operably associated with said indicia bearing member and movable thereby for entraining and moving an item to be printed upon therebetween whereby an impression of the indicia on said indicia bearing member is transferred to said item, and, means operably associated with said sheet item pathway forming means and moveable to a retracted position so as to expose said indicia bearing member to view.

13. Printing apparatus comprising, a printing wheel having indicia forming elements about its periphery, an ink transfer wheel rotatably mounted adjacent said ink transfer wheel with its periphery engaging the periphery of said printing wheel, means for rotating said ink transfer wheel and said printing wheel simultaneously, an inking shoe having an arcuate surface substantially conforming to the peripheral curvature of said transfer wheel, 70 means mounting said inking shoe for fluid floating movement about two axes substantially perpendicular to one another with its arcuate surface closely adjacent the periphery of said transfer wheel, means resiliently biasing said inking shoe toward said transfer wheel, means to under pressure into the space between said arcuate sur- 75 feed ink under pressure into the space between said arcuate surface of said inking shoe and said ink transfer wheel thus to provide a fluid bearing combining with said resilient means to support said shoe in flight closely adjacent to said transfer wheel and in a manner to effect a spreading of the ink evenly over the peripheral surface of said ink transfer wheel from which it is transferred to said indicia forming elements on the periphery of said printing wheel during rotation thereof, and means to feed items to be printed past and in contact with said indicia forming elements in a manner to print said indicia upon said items.

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