

Oct. 4, 1960

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PRINT AND INK WHEEL MECHANISM

Filed July 1, 1957

3 Sheets-Sheet 1

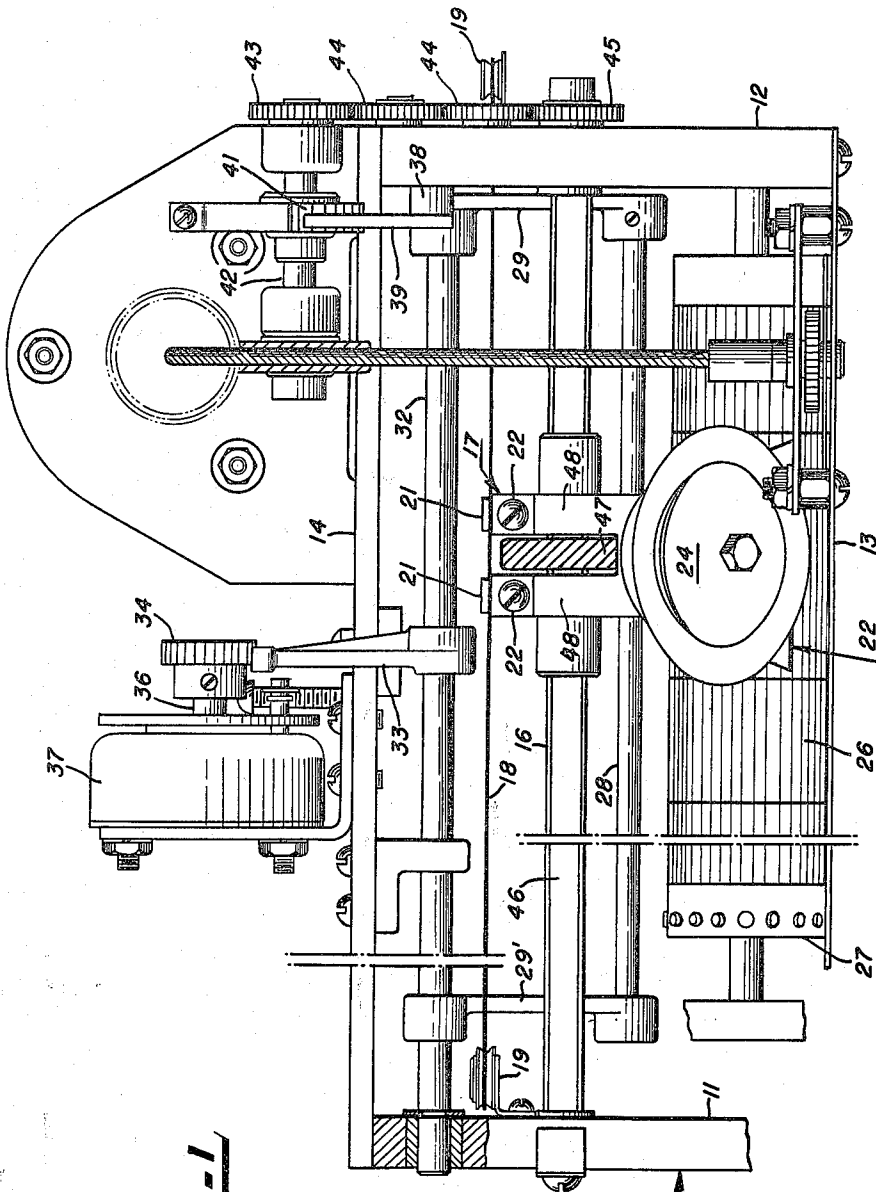


Fig. 1

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3 Sheets-Sheet 2

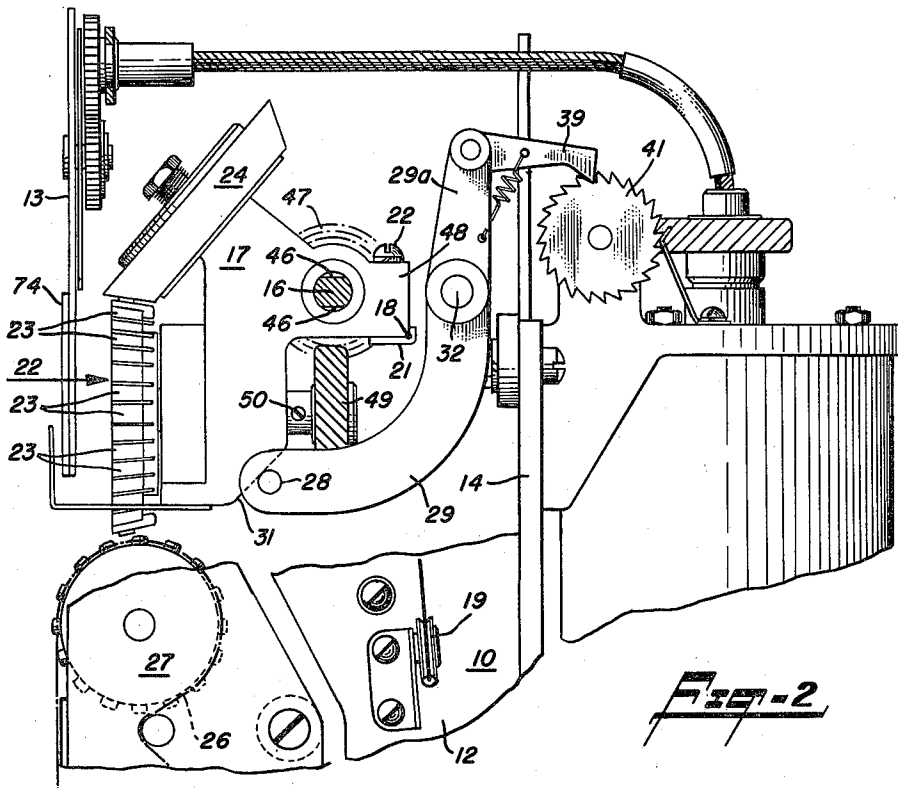


Fig. 2

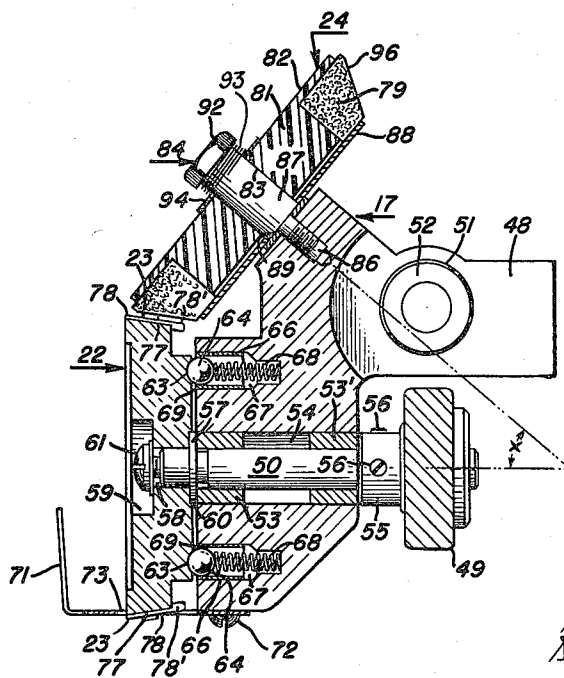


Fig. 3

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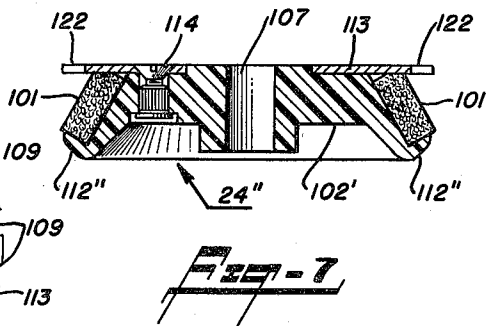
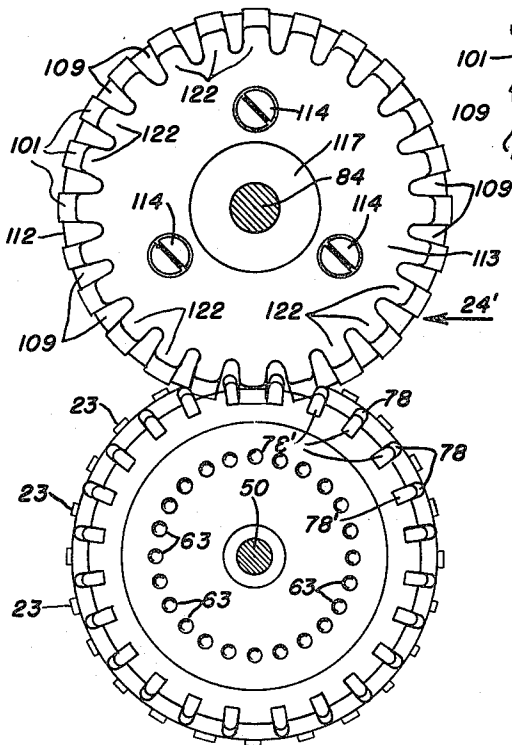
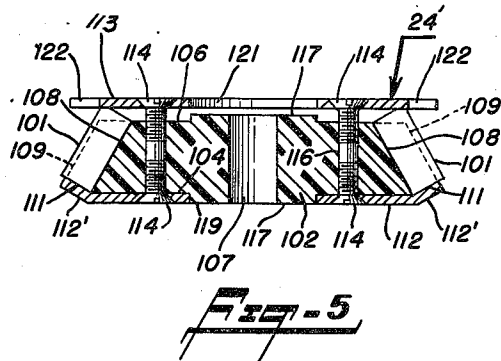
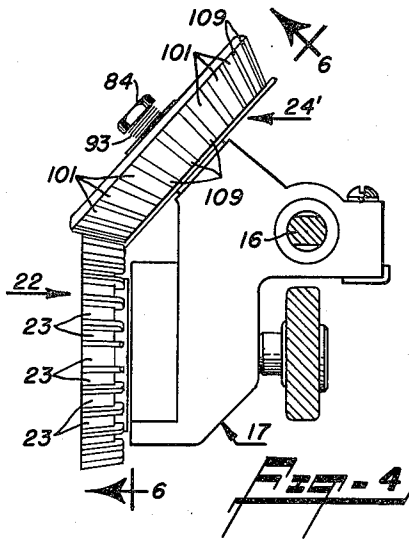
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PRINT AND INK WHEEL MECHANISM

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Filed July 1, 1957, Ser. No. 669,241

7 Claims. (Cl. 101—205)

This invention relates to a self-balancing type recording instrument and more particularly to the print and ink wheel mechanism for a multiple point recorder.

In multiple point recorders, a printing mechanism is often used which includes a print wheel carriage having a print wheel rotatably supported thereon. A plurality of printing characters are secured to the periphery of the print wheel. A chart upon which a record is to be made is positioned adjacent the print wheel carriage, and the printing characters are normally maintained out of recording engagement with the chart. The print wheel carriage is moved to a recording position corresponding to the value of a condition under measurement. (If temperature is being measured, for example, a thermocouple may be connected to the input of the instrument). A printing operation is performed by bringing a printing character on the print wheel in engagement with the chart. Thereafter, the print wheel is raised off the chart, rotated to bring an adjacent printing character into proper position for a subsequent printing operation, and another thermocouple switched to the input of the instrument. Generally, a printing operation for each thermocouple input is either performed cyclically, or is performed substantially immediately following a balanced condition of the instrument. The particular arrangement for initiating sequential printing operations forms no part of this invention. The general features of a multiple point recorder with which the print and ink wheel mechanism of this application may be used are shown in my co-pending patent application Serial Number 667,812, filed June 12, 1957, and entitled Recording Instrument.

Associated with the print wheel, and rotatably supported on the print wheel carriage, is an ink wheel having one of more ink pads secured thereto. The method employed to mount the ink wheel on the carriage forms one important feature of my invention. A novel spring biasing arrangement is utilized, which, among other advantages, automatically compensates for variations in the size of an ink pad, or pads.

If the record is to be made in a single color, an ink wheel with a single ink pad is utilized. When a single ink pad is used, the ink wheel is frictionally driven through contact with the printing characters upon rotation of the print wheel. The diameter of the ink pad is slightly less than the diameter of the print wheel at the point of contact between the wheel elements. Thus, the point of contact of the printing character with the ink pad changes every revolution, thereby resulting in a longer life of the pad.

With a multiple point instrument, it is often desirable to make the record of each value under measurement in a different, contrasting, color. For this purpose, an ink wheel, having a plurality of ink pads, is substituted for the single ink pad wheel. A separate ink pad for each printing character, is provided on the multiple pad ink wheel whereby the record of each printing character may

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be made in a different color for ease of identification of each record on the chart. The method of simply, and securely, mounting the individual ink pads on the ink wheel forms another important feature of my invention.

The chart, upon which the record is to be made, is generally driven over a steel drum. If metal printing characters are used, the characters must be critically adjusted, since the printing occurs on the curved drum surface. Further, with metal printing characters, the printing action may result in damage to the surface of the drum, as well as to the printing characters. To overcome these disadvantages, I use novel printing characters made of resilient material such as a rubber composition or resilient plastic. With such resilient printing characters, no critical adjustments are necessary to obtain sharp, legible, printing, and a smooth, quiet, printing operation results.

With multicolor printing, it is absolutely necessary that the print and ink wheels be synchronized. I provide a novel gear drive arrangement between the print and ink wheels and thereby insure synchronism between the wheels at all times.

An object of this invention is the provision of a multiple point recorder having a print and ink wheel construction provided with intermeshing gear elements whereby synchronism between the wheels is guaranteed at all times.

An object of this invention is the provision of a print wheel for a multiple point recorder in which printing characters made of a resilient material are used to absorb the printing impact and provide quiet operation without critical adjustment thereof.

An object of this invention is the provision of a novel ink wheel for use in a multiple point recorder and comprising a body member having a beveled edge, a plurality of radial wall members extending therefrom, front and rear retaining discs removably attached thereto and extending outwardly adjacent the ends of the said wall members, and ink pads wedgingly retained between the wall members and front and rear retaining discs.

An object of this invention is the provision of an ink wheel comprising a rotatably mounted body member having a generally frusto-conical shape, a plurality of substantially radially extending wall members formed on the edge of the said body member, an inclined annular wall member formed on the body member, adjacent one end of the said wall members, a retaining disc secured to the rear face of the said body member, and a plurality of ink pads wedgingly retained between the said wall members and retaining disc.

An object of this invention is the provision of a recorder having a print and ink wheel rotatably mounted upon a print wheel carriage, the said ink wheel having a beveled ink pad supported thereon and the said print wheel having a plurality of printing characters secured thereto, the diameter of the said ink pad at the point of contact with the said printing characters being somewhat different than the diameter of the print wheel with attached printing characters.

An object of this invention is the provision of a mounting arrangement for an ink wheel of either the unicolor or multicolor type, and comprising means axially biasing the said ink wheel into engagement with the printing characters on the printing wheel.

These and other objects and advantages will become apparent from the following description when taken with the accompanying drawings. It will be understood that the drawings are for purposes of illustration and are not to be construed as defining the scope or limits of the invention, reference being had for the latter purposes to the appended claims.

In the drawings wherein like reference characters denote like parts in the several views:

Figure 1 is a fragmentary top view of the recording mechanism of a multiple point recorder instrument;

Figure 2 is a fragmentary side view of the recording mechanism;

Figure 3 is a sectional view of a print wheel carriage with print and ink wheels rotatably attached thereto, and showing an ink wheel having a single ink pad mounted thereon;

Figure 4 is a side view of a print wheel carriage showing an ink wheel having a plurality of ink pads attached thereto;

Figure 5 is a cross sectional view of the ink wheel shown in Figure 4 only showing a rear retaining disc in a detached position prior to securing the ink pads to the wheel;

Figure 6 is a view taken on line 6—6 of Figure 4; and

Figure 7 is a cross sectional view of a modified form of multiple ink wheel.

As is well known, a multiple point recorder is designed to receive a plurality of input variables, and through operation of its circuitry and mechanism, to automatically record the value of the condition under measurement on a chart. If temperature is to be measured, for example, a plurality of thermocouples are sequentially connected to the input terminals of the measuring circuit of the recorder, which measuring circuit is often of the potentiometric type. An error signal from the potentiometer circuit is fed into a balancing circuit which includes a converter for changing the D.-C. error signal to an A.-C. signal suitable for amplification by an A.-C. amplifier. The amplified A.-C. signal is used to drive a reversible motor, also in the balancing circuit. The reversible motor is driven in a direction necessary to rebalance the potentiometer.

Upon actuation of the reversible motor, a print wheel carriage, having a print wheel rotatably supported thereon, is moved to a position above the chart corresponding to the temperature under measurement. A record is then made of this temperature by engagement of the print wheel with the chart. A different thermocouple is then connected to the input of the instrument and the print wheel carriage is moved to a position corresponding to this temperature and another record is made on the chart.

A complete disclosure of the recorder mechanism, including details of the printing operation, which are not pertinent to the subject matter of the present application, is given in my above-mentioned co-pending patent application Serial Number 667,812. For purposes of this disclosure, it is necessary to refer only briefly to Figures 1 and 2 of the drawings to describe the operation of the print wheel carriage over the chart, and the printing operation. Referring, then, to Figures 1 and 2, the recorder therein shown comprises a main frame, designated generally by reference numeral 10, which includes a pair of upright side members 11 and 12 having front and rear panels 13 and 14, respectively, secured thereto to form a rigid framework. A carriage supporting shaft 16 is rotatably supported between the side members 11 and 12 and, in turn, rotatably and slidably supports a print wheel carriage, designated 17, thereon. A cable 18 passes over a series of pulleys 19 on the main frame and is attached to this print wheel carriage 17 by L-shaped clamp members 21. Bolts 22 pass through apertures in the carriage and are threaded to the clamp members 21, and the cable is clamped between the carriage and clamp member by tightening the bolts. The cable is mechanically attached to a reversible motor (not shown). The motor, in addition, is mechanically connected to the movable arm of the potentiometer on the measuring circuit of the instrument. The motor is energized for rotation in one direction or the other to balance the poten-

tiometric network and thereby shift the cable and attached print wheel carriage along the carriage shaft 16. When the potentiometric network is balanced, the motor is deenergized, and the print wheel carriage located on the carriage shaft 16 at a position corresponding to the value of the condition under measurement.

A print wheel 22, having a plurality of printing characters 23 positioned on the edge thereof, and an ink wheel 24 are rotatably mounted upon the print carriage 17. A printed record of temperature is made by the print wheel upon a chart 26 driven by a chart driving drum 27. A constant speed chart drive motor rotates the drum, through suitable gearing, at a constant speed. The print wheel carriage is normally supported above the chart by means of a rod 28 which extends between lever arms 29 and 29'. As best seen in Figure 2, the carriage 17 slidably engages the rod 28 along an inclined surface 31 of the carriage. Periodically, the rod is moved out of engagement with the carriage, and, because the center of gravity of the carriage and attached print and ink wheels is offset to the left of the shaft 16 (as seen in Figure 2), the carriage will pivot about the shaft into a printing position wherein a printing character on the print wheel engages the chart. Immediately following the printing operation, the carriage is raised again by the rod 28 to the normal position shown. On the return movement of the carriage, an indexing operation rotates the print wheel to bring a new printing character into recording position above the chart in preparation of a subsequent printing operation.

The specific manner in which the printing and indexing operations are performed is immaterial to this invention, since this invention is directed primarily to the print and ink wheel construction. It will be sufficient to note that the lever arms 29, 29' are secured to a shaft 32 pivotally supported between the upright side members 11 and 12. As seen in Figure 1, an arm member 33 is secured to the shaft 32. The end of the arm 33 is provided with gear teeth which mesh with a gear 34 on a shaft 36 of a rotary solenoid 37. When the solenoid is energized, rotation of the gear 34 pivots the arm member 33 which, in turn, rotates the shaft 32. The rod 28, which is connected to the shaft 32 through the lever arms 29 and 29', is thereby pivoted a sufficient distance in a counter-clockwise direction (as seen in Figure 2) to allow the print wheel carriage to pivot about the shaft 32 into a printing position wherein one of the printing characters drops into printing engagement with the chart.

The indexing movement of the printing wheel is effected when the solenoid is deenergized following the printing operation. The solenoid is spring biased to return to normal position when deenergized. An upwardly extending portion 29a of the lever arm 29 is provided with a pawl 39 which engages a ratchet 41. As seen in Figure 1, the ratchet is mounted upon a shaft 42 having a gear 43 secured to one end. The gear 43 is connected through idler gears 44 to a gear 45 on the end of the carriage shaft 16. As seen in Figure 2, the shaft 16 has a pair of flat portions 46 thereon. A gear 47, having a bore of the same configuration as the shaft, is slidably mounted on the shaft. The gear 47 is positioned between parallel arm portions 48 forming a part of the carriage 17, and cooperates with a gear 49 on the end of a shaft 50, upon which shaft the printing wheel 22 is mounted. Thus, the printing wheel is rotated upon the return movement of the rod 28 to a normal position, through action of the pawl and ratchet, and associated gearing.

Reference is now made to Figure 3 wherein there is shown a cross-sectional view of the print wheel carriage 17 and attached print and ink wheels 22 and 24, respectively, made in accordance with my invention. The print wheel carriage 17, as mentioned above, is provided with a pair of parallel arm members 48 (only one of which is seen in Figure 3) having a bore 51 extending there-through. Cylindrical-shaped bearing members 52 (only

one of which is visible) are press fitted in each of the bores 51 for slidably and rotatably mounting the carriage on the carriage shaft 16 shown in Figures 1 and 2.

The printing wheel shaft 50 is mounted upon bushings 53 and 53' in a bore 54 in the carriage. The gear 49 on the shaft 50 is provided with an axial flange 55 having set screws 56 threaded thereto, and which secure the gear to the shaft. The end of the flange abuts the bushing 53' and prevents axial movement of the shaft 50 to the left, as viewed in Figure 3. A radial flange 57 is integrally formed adjacent the other end of the shaft 50 and abuts the bushing 53, thereby preventing axial movement of the shaft 50 to the right.

The print wheel 22 is provided with a bore 58 having enlarged recessed portions 59 and 60 at the front and rear thereof, respectively. The print wheel 22 is mounted on the end of the shaft 50 by means of a screw 61 threadedly engaged with a threaded axial hole in the shaft. The radial surface of the recess 60 abuts the flange 37 on the shaft. The print wheel is thereby clamped to the shaft between the flange 37 and screw 61 as the screw is tightened. A lock washer 62 is provided beneath the screw head.

The print wheel 22 is provided with a plurality of semi-circular indentations, or recesses, 63 circularly spaced in the rear surface thereof. The same number of recesses 63 are provided as there are printing characters 23 on the periphery of the print wheel. Spherical-shaped positioning members 64 are mounted within sleeve members 66, which are tightly fitted within recesses 67 in the carriage 17. The positioning members are biased outwardly by spring members 68, and are prevented by in-turned flanges 69 on the sleeve member from coming out of the sleeve members 66 when the print wheel is removed. The action of the spring biased positioning members 64 in the recesses 63 is to precisely, rotatably, position the print wheel to insure proper location of the print wheel over the chart during the printing process.

A pointer 71 is secured to the bottom of the carriage by a screw 72. The pointer is apertured as at 73, thereby permitting the print wheel to extend downwardly there-through. The end of the pointer is turned upwardly and cooperates with a suitably calibrated scale 74 mounted on the front panel 11 as seen in Figure 2.

The edge of the print wheel is provided with a plurality of beveled surfaces 77 upon which the printing characters are secured, as by gluing or cementing, or any other suitable means. The amount, or degree of bevel, is determined by the location of the chart drum below the printing wheel. The bevel is such that the printing character at the bottom of the wheel makes proper contact with the chart on the drum when the carriage swings downwardly about the shaft 16 in a printing operation. The printing characters fit between radially extending wall members 78 formed on the printing wheel edge. The wall members have integrally formed rearwardly extending portions 78' which form teeth members for use with a multicolor ink wheel shown in Figures 4 through 6 and described below.

The ink wheel 24 shown in Figure 3 is adapted to support a single, annular-shaped, ink pad 79 for unicolor printing. The ink wheel comprises a cylindrical-shaped body 81, which may be made of plastic, as shown, or of other suitable material. A radially extending flange 82 is integrally formed at one end of the body and provides a radially supporting surface against which the ink pad 79 abuts. The body portion 81 is provided with an axial bore 83 therethrough for rotatably mounting the wheel on a screw 84. The screw 84 is threaded into a threaded aperture 86 in the print wheel carriage 17. The screw is provided with an enlarged shank portion 87 upon which the ink wheel is rotatably supported. A large flat member 88 loosely fits over the shank 87 of the screw and abuts the rear surface of the ink pad 79; preventing the ink pad from sliding off the wheel. The screw is turned

down tightly to a position wherein a shoulder 89, formed by the end of the enlarged shank portion 87, abuts a small washer 91 positioned between the shoulder and carriage. The screw has an enlarged head 92 which is positioned a spaced distance above the ink wheel. A coil spring 93 and flat washer 94 are positioned between the screw head and ink wheel thereby biasing the ink wheel axially in the direction of the carriage. As the print wheel 22 is rotated during an indexing operation, in the manner described above, the ink wheel is frictionally driven, through contact between the printing characters and ink pad.

It will be noted that the axis of rotation of the ink wheel is oriented at an angle, designated x , to the axis of rotation of the print wheel. The edge of the ink pad 79 is provided with a beveled surface 96; the degree of bevel being such that the surface 96 at the point of contact with a printing character 78 is substantially parallel to the printing character. In this way, as the print and ink wheels are rotated, the ink from the ink impregnated pad, is evenly distributed over the printing character.

Ink pads, which are generally made of felt, or other suitable material, will vary in thickness, and in height within a relatively wide range of manufacturing tolerance. My novel spring biased ink wheel compensates for any such variations in size between felt pads; the ink wheel being constantly biased toward the print wheel by action of the spring 93. The spring biased ink wheel accommodates variations in the thickness or height of both individual ink pads and between different ink pads, thus providing a relatively constant pressure between the ink pad and all of the printing characters, thereby resulting in uniform printing of the characters. In addition, the spring biased wheel makes up for wear and compression of the felt pad in service.

It will be understood that the precise angle x between the print and ink wheel axes is not important to the proper functioning of my novel spring biased ink wheel. Regardless of the angle x , the bevel on the ink pad is preferably such that the contacting ink pad and printing character are substantially parallel for a relatively even distribution of ink on the characters.

To minimize localized wear of the ink pad, the radius of the pad is made slightly less than the radius of the print wheel at the point of driving contact between the pad and printing characters. Because of the difference in radii, the point of contact of each printing character changes slightly every revolution of the print wheel. This results in a longer life of the felt pad than if the radii are the same. The same print wheel 22 is adapted to be used with an ink wheel having a plurality of individual pads, as well as the single pad wheel, shown in Figure 3. For this reason, the radii of the print wheel and ink pad must be nearly the same, as the rotation of the print and ink wheels are synchronized in multicolor printing operations. A detailed description of a multicolor ink wheel is given below, in reference to Figures 4 through 6.

Referring now to Figure 4 of the drawings, a side view of a printing mechanism, which is suitable for multicolor printing, is therein shown. In Figure 4, the print wheel carriage and print wheel are of the same construction as those shown in Figures 1 through 3. An ink wheel 24', having a plurality of ink pads 101 attached thereto, is shown mounted on the carriage 17. It will be understood that the multicolor ink wheel 24' is interchangeable with the unicolor wheel described above, and is mounted on the carriage by the same screw 84 and biasing spring 93 arrangement. The construction of the ink wheel is best seen in the partially disassembled sectional view of the wheel as shown in Figure 5. Referring to Figure 5, the ink wheel 24' comprises a main body portion 102, made of plastic, or other suitable material, and having generally parallel opposite faces 104 and 106, respectively. An aperture 107 is

provided through the center of the body for mounting the wheel on the carriage in the manner described above. The body portion 102 is of a generally right-frusto-conical shape, having sloping edges 108, which are provided with a plurality of equally-spaced and generally radially extending wall members 109 integrally formed therewith. (See also Figure 4.) The wall members provide separate compartments, or sections, within which the ink pads 101 are positioned. One beveled edge 111 of the wall members forms substantially a right angle with the adjoining edge 108 of the body, while the other, opposite, edge or end of each of the wall members extends in the plane of the face 106. Front and rear retaining discs 112 and 113, respectively, are attached to the body member by screws 114, which are turned into threaded apertures 116 in the body. Axial front and rear locating bosses 117 and 118, respectively, on the surfaces of the body extend through central apertures 119 and 121 in the front and rear discs, in the assembled condition of the ink wheel, and aid in centering the retaining discs on the body.

The front retaining disc 112 is provided with an inclined, or frusto-conical shaped, annular edge 112' which abuts the beveled edges 111 of the wall members 109. The rear retaining disc 113 is of a plane cylindrical shape, which is provided with a plurality of integrally formed gear teeth members 122 about the periphery thereof.

With my novel ink wheel, all of the ink pads are secured into position on the wheel between the front and rear retaining discs. To mount the ink pads on the wheel, the wheel is removed from the carriage and positioned, as shown in Figure 5. The ink pads, which are normally of a generally rectangular shape, are placed in the compartments against the inclined surfaces 108 on the body of the wheel, and against the edge 112' on the front retaining disc. The ink pads are maintained in position on the wheel by tightening the rear retaining disc 113 from the position shown in Figure 5, to a position against the rear face 106 of the body. The disc 113 initially engages an extending corner of each of the generally rectangular-shaped ink pads (see Figure 5) and, upon securing the disc to the wheel, the ink pads are compressed and distorted as shown in Figure 7. In this process, the ink pads are wedged securely into position on the wheel, with the pad ends abutting the retaining discs. It will be seen, then, that all of the ink pads are easily removed and replaced with a minimum of effort.

Reference is now made to Figure 6 of the drawings, which is taken on line 6-6 of Figure 4. In Figure 6, the positive drive connection between the print and ink wheels is clearly shown. The rearwardly extending portions 78', of the wall members 78 on the print wheel, engage the gear teeth members 122 on the edge of the ink wheel rear retaining disc 113. During the indexing operation the ink wheel positively drives the ink wheel, thus assuring synchronism between the print and ink wheels at all times.

Reference is now made to Figure 7 wherein there is shown a modified form of multicolor ink wheel, designated 24'', which ink wheel is similar to the ink wheel 24' shown in Figures 4, 5 and 6, and described above. However, instead of using a front disc 112 with an inclined annular edge portion 112' thereon, as shown in Figures 4, 5 and 6, the body portion 102' of the ink wheel 24'' is provided with an integrally formed inclined annular edge portion designated 112'' against which the end of the ink pads 101 abut. The rear retaining disc 113, in Figure 7, is shown attached to the body 102' by screws 114 (thereby compressing the ink pads 101 and holding them in position on the wheel. The ink pads are easily replaced by removing the screws 114 and lifting the rear retaining disc 113 from the body 102'. The body 102' is easily molded and requires a mini-

mum of machining operations, whereby an effective, yet inexpensive, ink wheel may be formed.

A final important feature of my invention resides in the composition of the printing characters 23 on the print wheel. In present day recording instruments, hard, solid, printing characters are employed, which are generally made of metal, nylon, hard plastic, or other like materials. The driving drum 27 (Figures 1 and 2) over which the chart 26 is driven, is made of steel, or other suitable material. Since the printing characters print on the radius of the drum, they must be critically adjusted, if made of metal, nylon, or other hard material, in order to obtain a clear record. Furthermore, when metal printing characters are used, the printing action between the hard metal surfaces would damage the surface of the drum as well as the printing characters. All of the above disadvantages are eliminated by the use of printing characters which are made of resilient material, such as rubber composition, plastic, or the like. No critical adjustments are necessary to obtain sharp, legible printing. Further, the printing impact is greatly absorbed by the resilience of the printing character, resulting in quiet and smooth operation.

Having now described my invention in detail, in accordance with the patent statutes, various changes and modifications will suggest themselves to those skilled in this art. It is intended that such changes and modification shall fall within the spirit and scope of the invention as recited in the following claims.

I claim:

1. An ink wheel comprising a generally right-frusto-conical shaped body member having generally parallel faces, a plurality of generally radially and axially extending wall members equally spaced on the edge of the said body member and forming a plurality of compartments thereon, the end of the said wall members adjacent one face of the body member forming an angle with the said body face, first and second retaining discs secured to the said body member, at least one of the said retaining discs being removably secured thereto, the said retaining discs adjacent the edges thereof extending substantially parallel to and adjacent the ends of the said wall members, and a plurality of ink pads wedgingly retained between the said retaining discs in the compartments formed in the body member.

2. An ink wheel comprising a generally right-frusto-conical-shaped body member having parallel first and second faces, the said first face being of greater area than the said second face, a plurality of generally radially and axially extending wall members equally spaced on the edge of the said body member and forming a plurality of compartments thereon, one end of the said wall members adjacent the said first face forming an angle of substantially 90 degrees with the adjacent portion of the body edge, the other end of the said wall members adjacent the said second face extending substantially parallel therewith in the same plane, a first retaining disc adjacent the said first body face and having an inclined flanged edge adjacent the one end of the wall members, a second retaining disc adjacent the said second body face and extending outwardly adjacent the other end of the wall members, means securing the said first and second retaining discs to the said body member, and a plurality of ink pads wedgingly retained between the said first and second retaining discs in the compartments formed on the body member.

3. An ink wheel comprising a rotatably mounted body member having a generally frusto-conical shape, a plurality of substantially radially and generally axially extending wall members on the edge of the said body member, a generally flat first retaining disc removably secured to the smaller diameter face of the said body member, the said first retaining disc having an annular edge extending outwardly beyond the said smaller diameter face of the said body member, a second retaining disc at the large

diameter face of the body member and having an annular frusto-conical shaped edge formed thereon which extends outwardly beyond the larger diameter face of the said body member, and a plurality of normally generally rectangular-shaped ink pads between the said wall members, the said ink pads being wedgingly retained between the plane first retaining disc and the frusto-conical shaped annular edge of the said second retaining disc.

4. The invention as recited in claim 3 wherein the said second retaining disc is integrally formed with the said body member.

5. The invention as recited in claim 3 wherein the said second retaining disc is removably secured to the large diameter face of the said body member.

6. The invention as recited in claim 3 including gear teeth integrally formed on the edge of the said flat first retaining disc and adapted to intermesh with gear teeth on an adjacent print wheel for synchronous rotation of the said print and ink wheels.

7. The invention as recited in claim 3 wherein one end of each of the said wall members is positioned adjacent the said frusto-conical-shaped edge of the said second retaining disc, the said one end of each of the said wall members forming a generally right angle with the adjacent edge of the body member, the other end of each

of the said wall members extending in a plane which is substantially parallel to the smaller diameter face of the said body member.

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