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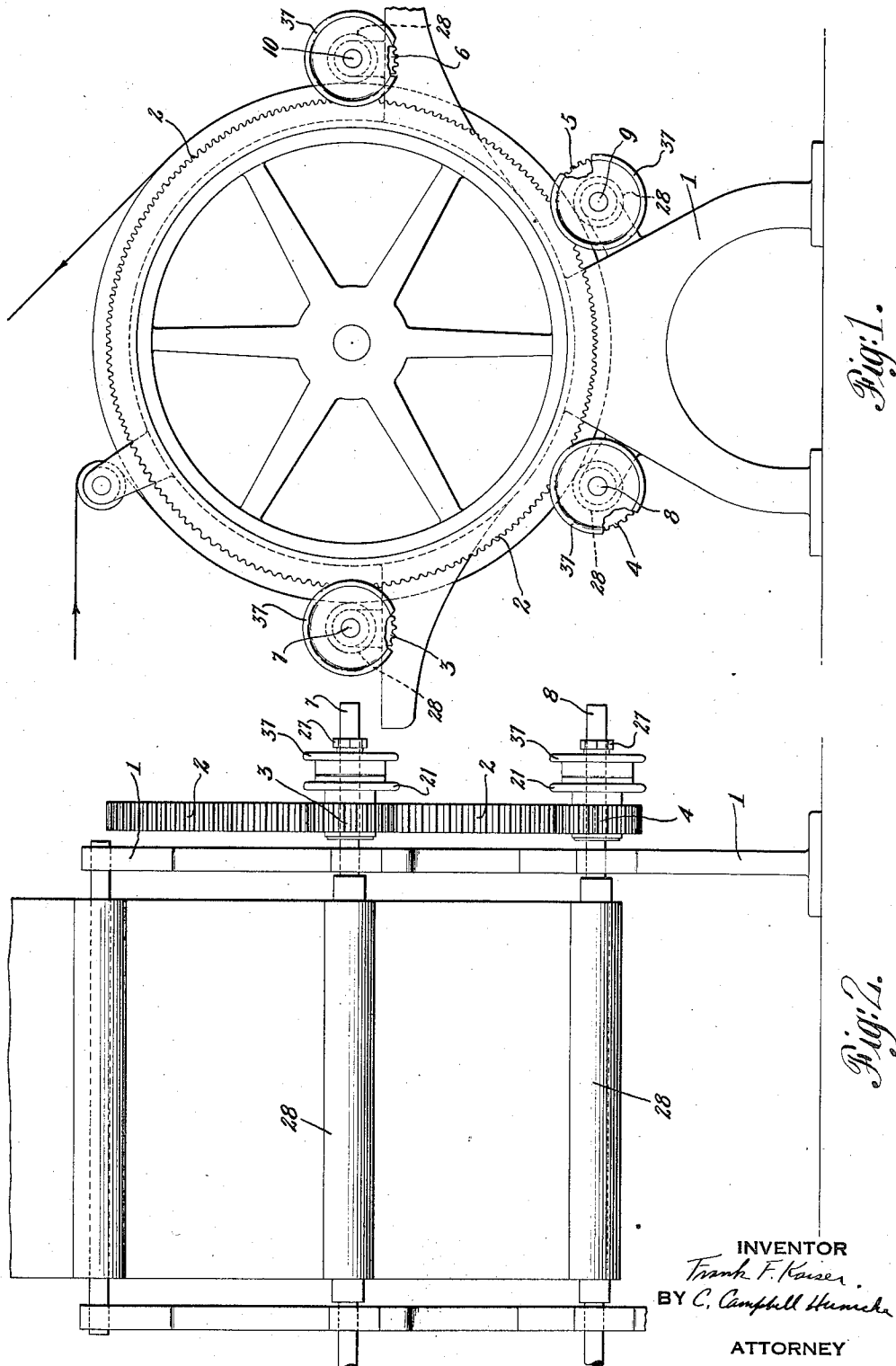
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2,015,036

DIFFERENTIAL REGISTERING GEAR

Filed March 10, 1934

3 Sheets-Sheet 1



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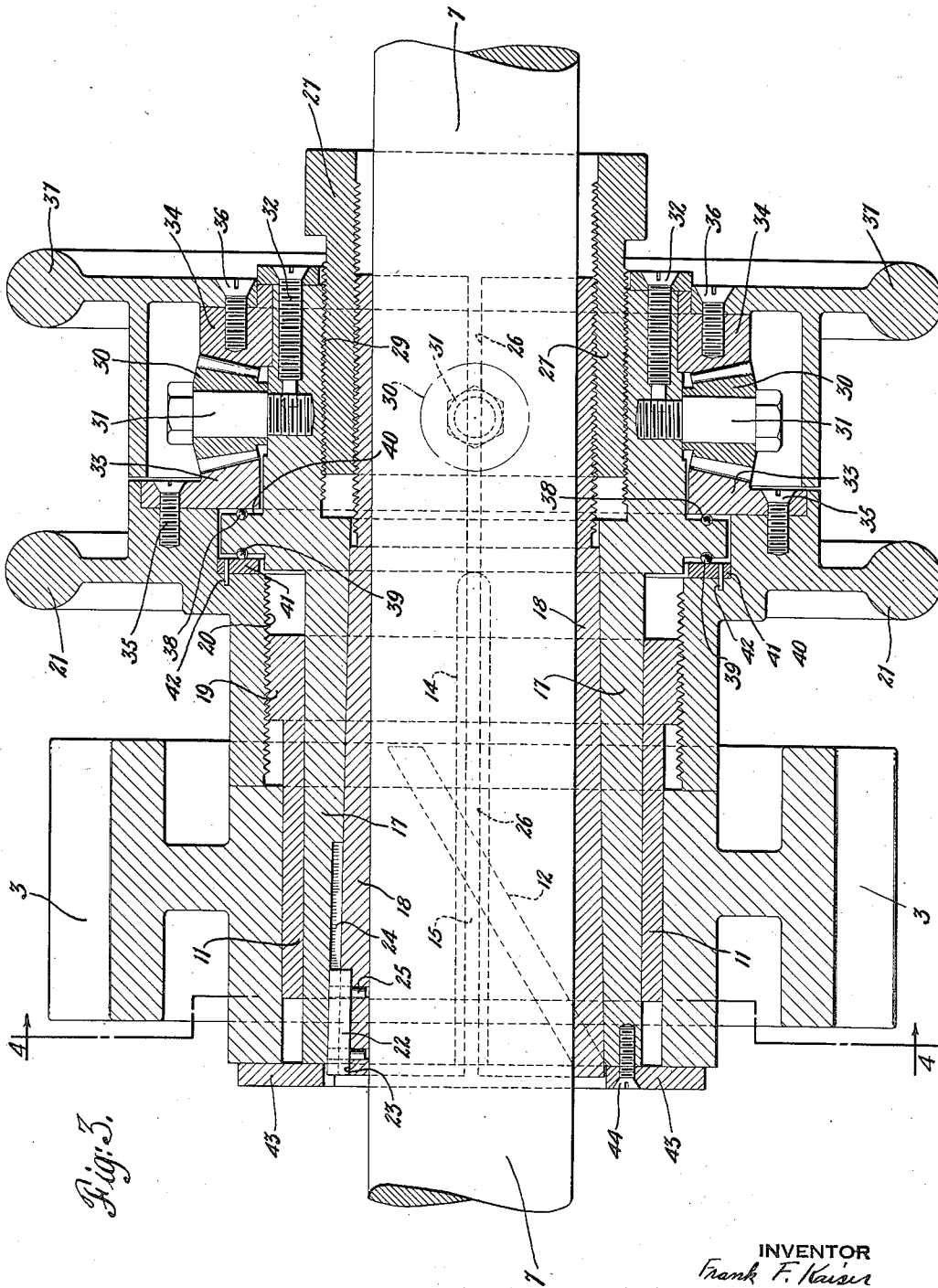
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DIFFERENTIAL REGISTERING GEAR

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3 Sheets-Sheet 2



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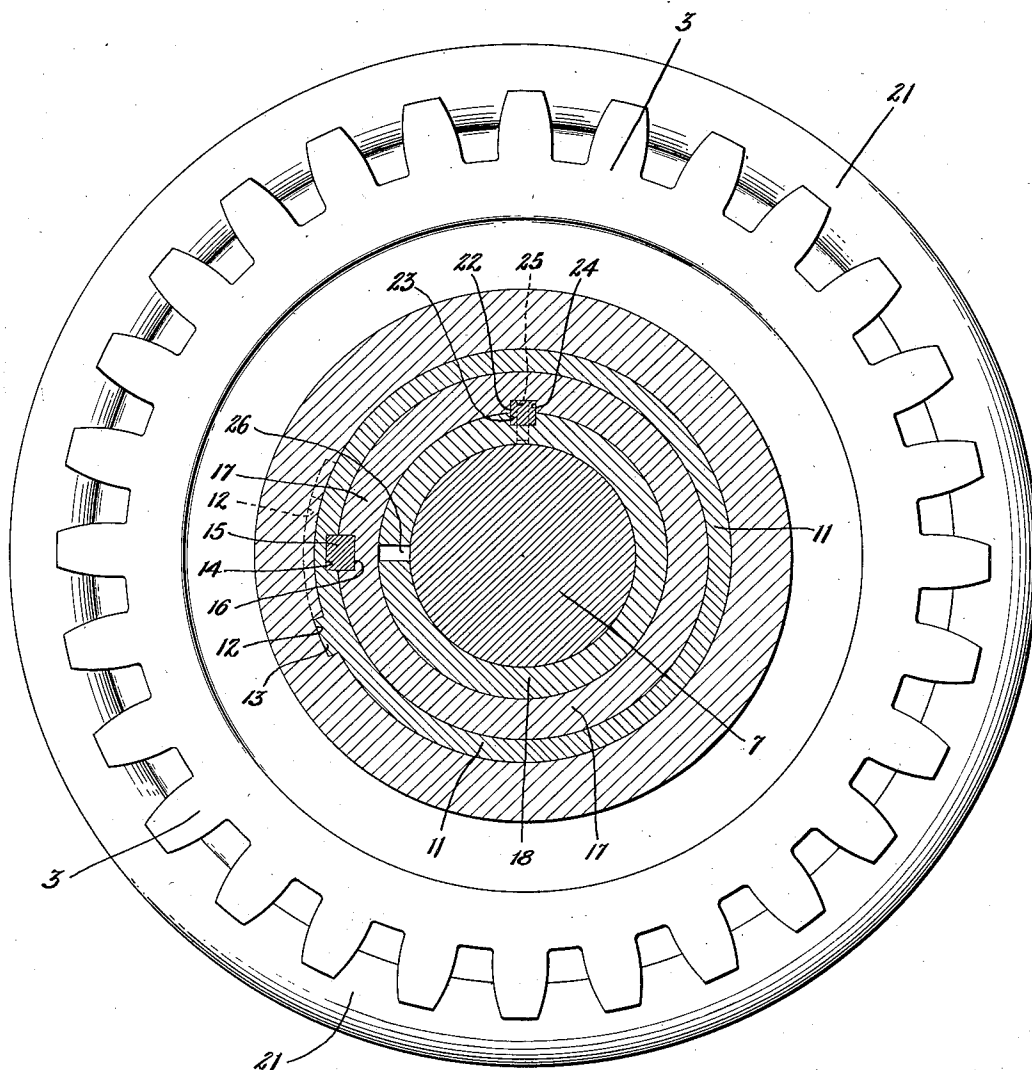
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Fig: 4.



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DIFFERENTIAL REGISTERING GEAR

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5 Claims. (Cl. 101—248)

This invention relates to differential registering gear.

In printing and the allied arts where a plurality of printing rollers are utilized, it is necessary that the registration of the various rollers be accurate. Such registration has generally been accomplished by means of registering gears carried by the rollers operated by a worm and worm wheel adjustment. With the usual form of adjusting mechanism considerable material is wasted as the machine must be in operation during the adjustment and the time required in making the adjustment permits of long lengths of material being ruined by improper registration until the accurate adjustment is completed.

In many of the means for adjusting the registration of the printing rolls heretofore used there is danger in the operator catching his fingers or clothing in the mechanism, frequently causing serious injury.

One of the objects of this invention is to provide means for adjusting the printing machines or other machines where registration of various rolls are required in a relatively short space of time.

Another object of the invention is to provide rolls and means for registration whereby registration can be made and the mechanism locked securely in position to remain so for the duration of the operation.

A still further object of the invention is to reduce the loss of materials in securing registration of rolls in connection with a pattern.

A still further object of this invention is to provide a simple mechanism so that the operator of the machine may secure registration of printing rolls without injury to himself.

A still further object of the invention is the avoidance of a loose pin locking mechanism for locking the rollers and pattern which loose pin, if dropped into the mechanism, ruins the gears.

Referring to the drawings:

Figure 1 is a semi-diagrammatic view in end elevation of a multi-color printing machine embodying the principles of my invention.

Figure 2 is a semi-diagrammatic view of the front view of Figure 1.

Figure 3 is a cross sectional view of the differential gear registering mechanism.

Figure 4 is a sectional view of Figure 3 along the line 4, 4, looking in the direction of the arrows.

My invention is adapted to various types of machines wherein rollers must be kept in registration with a common pattern. It is particu-

larly adapted for use in the multi-color printing or intaglio printing machines.

I have shown in Figure 1 the application of the invention to a multi-color printing machine. In this type of machine a frame 1 supports a main or master gear 2 which drives any number of registering gears that may be required for the necessary number of rolls. I have shown in the drawings four registering gears 3, 4, 5, 6. Of course, the number may be varied in accordance with the requirements. These registering gears may be of any size required by the size of the printing roller which they in turn drive through shafts 7, 8, 9 and 10. It should be noted that with my construction the only changes required to fit the device for various size patterns is the change in the registering gears 3, 4, 5 and 6, and their cooperating rollers. The remainder of the mechanism remains the same. This is a distinct advantage over the usual form of construction. As the registering gears are all similar only one of them need be described together with the registering gear mechanism. (Referring to Figures 3 and 4). Gear 3 has journaled therein a sliding sleeve 11. Also within gear 3 is an angle keyway 12 wherein angle key 13 operates. Angle key 13 is carried by sleeve 11. Sleeve 11 also has an internal keyway 14 within which is key 15. Key 15 is secured in groove 16 in the exterior of intermediate sleeve 17. Sleeve 17 is a lock sleeve 30 and is taper bored internally to fit sleeve 18. Sleeve 11 at one end has a threaded portion 19 which cooperates with the threaded portion 20 of the differential handwheel 21. Internal sleeve 18 is a split sleeve exteriorly tapered to cooperate with sleeve 17. Sleeve 18 is prevented from revolving inside of sleeve 17 by key 22 in keyway 23 of internal sleeve 18 and keyway 24 of intermediate sleeve 17. Key 22 is secured in internal sleeve 18 by pins 25 and slides in the keyway 24 of intermediate sleeve 17. Internal sleeve 18 is bored to fit the journal of the printing roller and is split on one side lengthwise at 26 to permit contraction when sleeve 18 is drawn into intermediate sleeve 17 by locking nut 27 and thereby grips the journal 7 carrying the printing roller 28. Internal sleeve 18 is threaded at one end for locking nut 27.

The differential mechanism is as follows:

Locking nut 27 is also exteriorly threaded 50 and cooperates with threaded portion 29 of intermediate sleeve 17. Exteriorly of threaded intermediate sleeve 17 are differential pinions 30 supported from intermediate sleeve 17 by four studs 31. Set screws 32 prevent the accidental 55

displacement of studs 31. Two ring gears 33, 34, cooperate with differential pinions 30. Ring gear 33 is secured by screws 35 to handwheel 21 and ring gear 34 is secured by screws 36 to handwheel 37. Thrust bearings 38 are positioned between gear 33 and bearing surface 40 integral with intermediate sleeve 17. Thrust bearings 39 are positioned between thrust plate 41 secured to handwheel 21 by pins 42 and bearing surface 40 of intermediate sleeve 17.

Gear 3 is maintained in position and is readily replaceable by removal of plate 43 which is secured to intermediate sleeve 17 by screws 44. It should be noted that the registering gears are thus easily replaced when a change in size is required.

The operation of the device is as follows:

The proper size registering gears 3, 4, 5, 6, are secured in position by plate 43 and the screws 44 are made fast. Of course, the proper size printing rollers have been positioned on the shafts. Then locking nut 27 is backed out of intermediate sleeve 17 part way to permit internal sleeve 18 to slide on the printing roller journal 7. The reason for this action is that internal thread of locking nut 27 is of a different pitch, that is, coarser than the external thread. When gear 3 is in mesh with master gear 2, locking nut 27 is screwed in thereby drawing internal sleeve 18 into intermediate sleeve 17 and contracting the split in the internal sleeve 18 to grip the printing roller journal 7 and thereby locking intermediate sleeve 17 and thus the entire mechanism to journal 7. Assuming the drive of the rollers to be in clockwise direction by gear 2, then for registration of roller 28 inside of gear 3 the operator grasps handwheel 21 which is revolving in a clockwise direction at the same speed as gear 3 and roller 28, and by holding the handwheel 21 from revolving, gear 3 continues to revolve in a clockwise direction and as gear 3 is keyed to sleeve 11 by angle key 13, sleeve 11 is rotated in a clockwise direction thereby causing sleeve 11 to screw out of handwheel 21, thus causing sleeve 11 to slide along intermediate sleeve 17 away from handwheel 21. This movement causes sliding sleeve 11 and in consequence intermediate sleeve 17 to turn in a clockwise direction inside of gear 3 thus advancing the printing roller with respect to the pattern and with respect to the relation of the other rollers. If it is necessary to retard the roller 28 inside of gear 3 the operator grasps the handwheel 37 which is also revolving in a clockwise direction and the operator prevents the revolution of the handwheel 37. By holding handwheel 37, intermediate sleeve 17 continues to revolve and as it carries the differential pinions 30, intermediate sleeve 17 drives ring gear 33 causing handwheel 21 to rotate twice as fast as sleeve 17. As handwheel 21 revolves in the same direction as gear 3, but twice the speed of gear 3, it causes sleeve 11 to screw into handwheel 21 away from gear 3. The movement of sleeve 11 turns intermediate sleeve 17 in a counter clockwise direction inside of gear 3 and thus retards roller 28 thereby retarding roller 28 with respect to the other rollers of the machine.

In order to accomplish the registration, it should be noted that the operator may keep his eye on the pattern either already formed on the web or being formed and in case of lack of registration he either advances the particular roll not in registration or retards same by grasping and holding either of handwheels 21 or 37 until

he sees the registration has been accomplished and upon releasing of either handwheel 21 or 37 the roll remains in pattern. The operator therefore at all times has complete control of the particular roll, is not obliged to remove registering pins or the like, or to attempt to whirl a handwheel or the like faster than the speed of the gear 3 to cause registration where retard is necessary. The speed of adjustment possible with my invention materially reduces the wastage and the safety of the operator from injury is assured. In this connection it should be noted that handwheel 37 completely encloses the differential mechanism so that neither the clothing nor the fingers of the operator can be caught by projecting studs 31.

Also the mechanism is locked when set in any position, hence the roll will remain in registration during the remainder of the operation. This locking feature reduces the wear and tear that was so prevalent in previous structures and permits of a greater life and a more efficient operation. In addition, there need be no sequence of adjustment, that is, any of the rolls may be adjusted in any order and independently of the other. Of course, it should be understood that when rolls and gears are changed that an approximate registration is done before the web is threaded through in order to reduce wastage. This is common practice and the rolls are marked when they are made by the engravers for approximate registration.

By means of my invention, wastage can be reduced to approximately one-twelfth of the general average per pattern or roll.

It will thus be seen that I have invented a simple but effective apparatus for registering rolls which is quick in operation, permitting the operator at all times to view the pattern without moving from his position, thereby reducing the time of adjustment and increasing the accuracy of the adjustment with complete safety to the operator and a large saving in the material, the saving depending upon the accuracy required in registration.

What I claim is:

1. In a differential registering device in combination with a master gear, a printing roll, a shaft for said printing roll, a gear carried by said shaft, said gear meshing with said master gear, means whereby said printing roll may be advanced or retarded to fit the pattern being printed, said means comprising a differential mechanism consisting of four pinion gears and two ring gears, handwheels connected to each of said ring gears, an exteriorly tapered sleeve keyed to said shaft, a second sleeve encircling and keyed to said first sleeve, said second sleeve carrying said pinion gears, a third sleeve encircling said second sleeve and slidably keyed thereto, said third sleeve having an exteriorly threaded portion cooperating with an interiorly threaded portion carried by one of said handwheels.

2. In a differential registering device, a master gear, a printing roll, a shaft for said printing roll, a gear carried by said shaft and meshing with said master gear, a split sleeve on said shaft, threaded at one end, a second sleeve surrounding said split sleeve and threaded at one end, said split sleeve tapered exteriorly and said encircling sleeve interiorly, the threads on said split sleeve being of lesser number to the inch than the threads on said encircling sleeve, a hollow nut threaded interiorly and exteriorly to cooperate with the threads of said sleeves whereby when

said nut is screwed into the exterior sleeve and onto the split sleeve, the split sleeve will be contracted to grip said shaft by the movement relative to the exterior sleeve due to the difference in the number of threads, and means for securing said printing roll gear to said encircling sleeve, said printing roll gear being in fixed rotative position with respect to said master gear.

3. In a differential registering device in combination with a master gear, a printing roll, a shaft for said printing roll, a gear carried by said shaft and meshing with said master gear, a plurality of sleeves on said shaft, means for locking said printing roll gear to said shaft through said sleeves, said means comprising a threaded portion on one sleeve cooperating with a threaded portion on another, a second threaded portion of one of said sleeves cooperating with a threaded portion on a third sleeve, said threaded portions of two of said cooperating sleeves varying in the number of threads to the inch with respect to the other two cooperating portions of one of said sleeves and the third sleeve, whereby the relative movement of one sleeve with respect to the other causes a locking effect.

4. In a multi-color printing machine in combination with a master gear, a printing roll, a shaft for said printing roll, a gear carried by said shaft and meshing with said master gear, a sliding sleeve, said printing roller gear keyed to said sliding sleeve, said sliding sleeve having an exteriorly threaded portion cooperating with a threaded portion of a handwheel, said handwheel secured to a ring gear of a differential mechanism, a locking sleeve, a spiral keyway in said

gear on said shaft, said sliding sleeve mounted exteriorally on said locking sleeve and keyed thereto whereby when said handwheel is held from rotation said sliding sleeve is drawn toward said handwheel whereby said gear on said printing shaft causes said locking sleeve and printing roller by means of said spiral keyway and the key on said sleeve to rotate at a different speed with respect to said printing shaft gear to cause said printing roll to move relative to the pattern being printed on the material.

5. In a multi-color printing machine in combination with a master gear, a printing roll, a shaft for said printing roll, a gear carried by said shaft and meshing with said master gear, said printing roll gear maintained in fixed position with respect to sidewise movement, a sliding sleeve, said printing roller gear keyed to said sliding sleeve, said sliding sleeve having an exteriorly threaded portion cooperating with a threaded portion of a handwheel, said handwheel secured to a ring gear of a differential mechanism, a locking sleeve a spiral keyway in said gear on said shaft, said sliding sleeve mounted exteriorally on said locking sleeve and keyed thereto whereby when said handwheel is held from rotation said sliding sleeve is drawn toward said handwheel whereby said gear on said printing shaft causes said locking sleeve and printing roller by means of said spiral keyway and the key on said sleeve to rotate at a different speed with respect to said printing shaft gear to cause said printing roll to move relative to the pattern being printed on the material.

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