

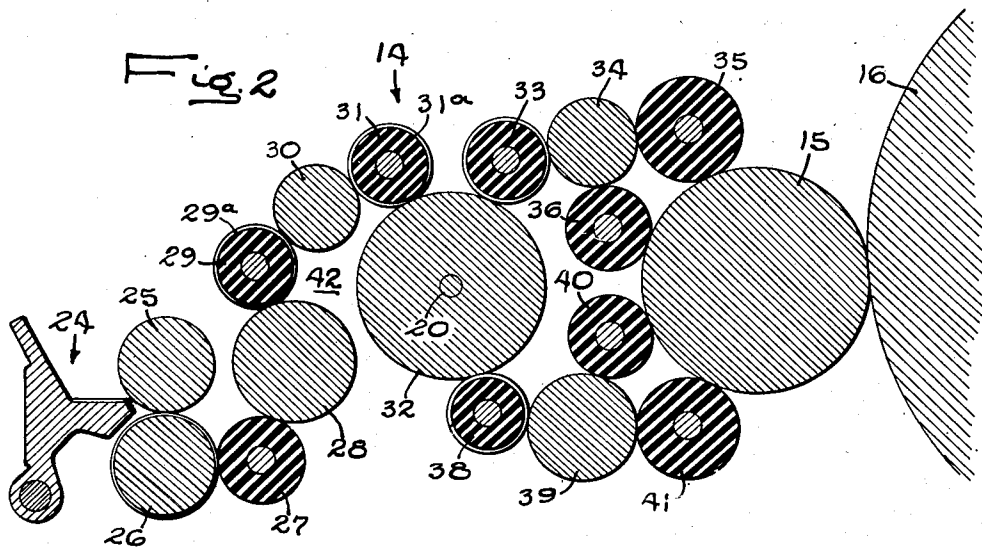
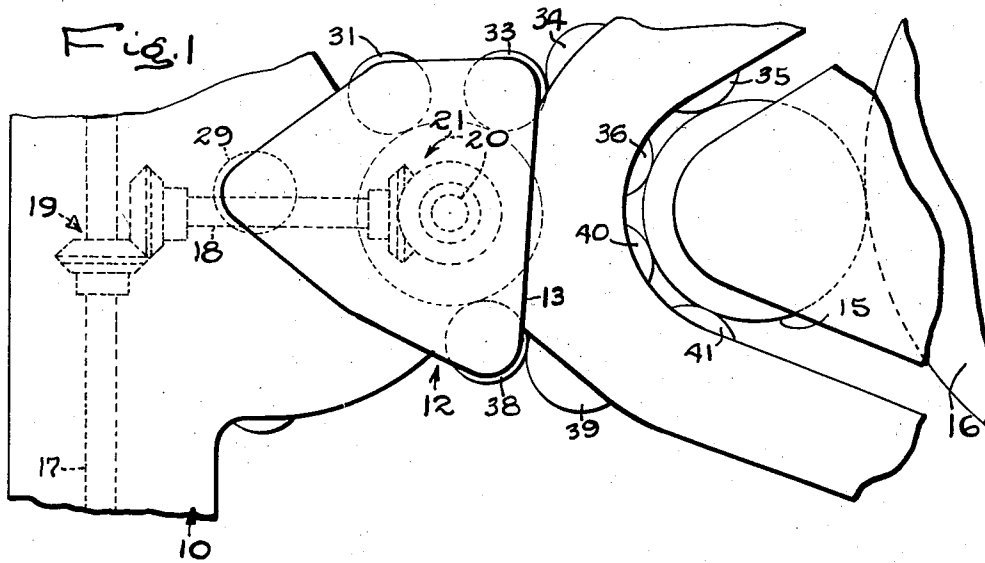
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INK ROLLER VIBRATOR

2,581,687

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3 Sheets-Sheet 1



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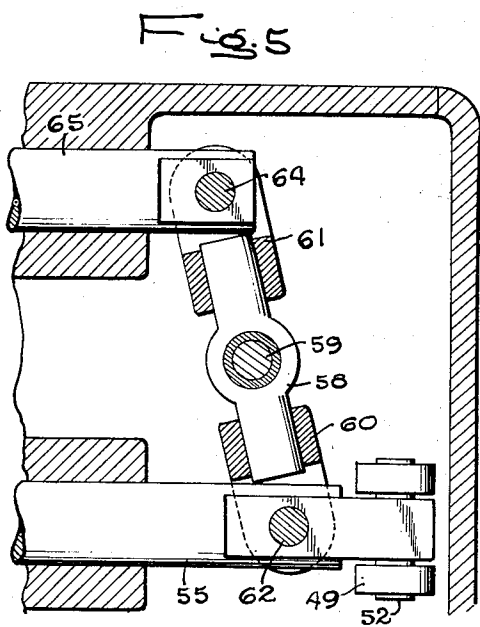
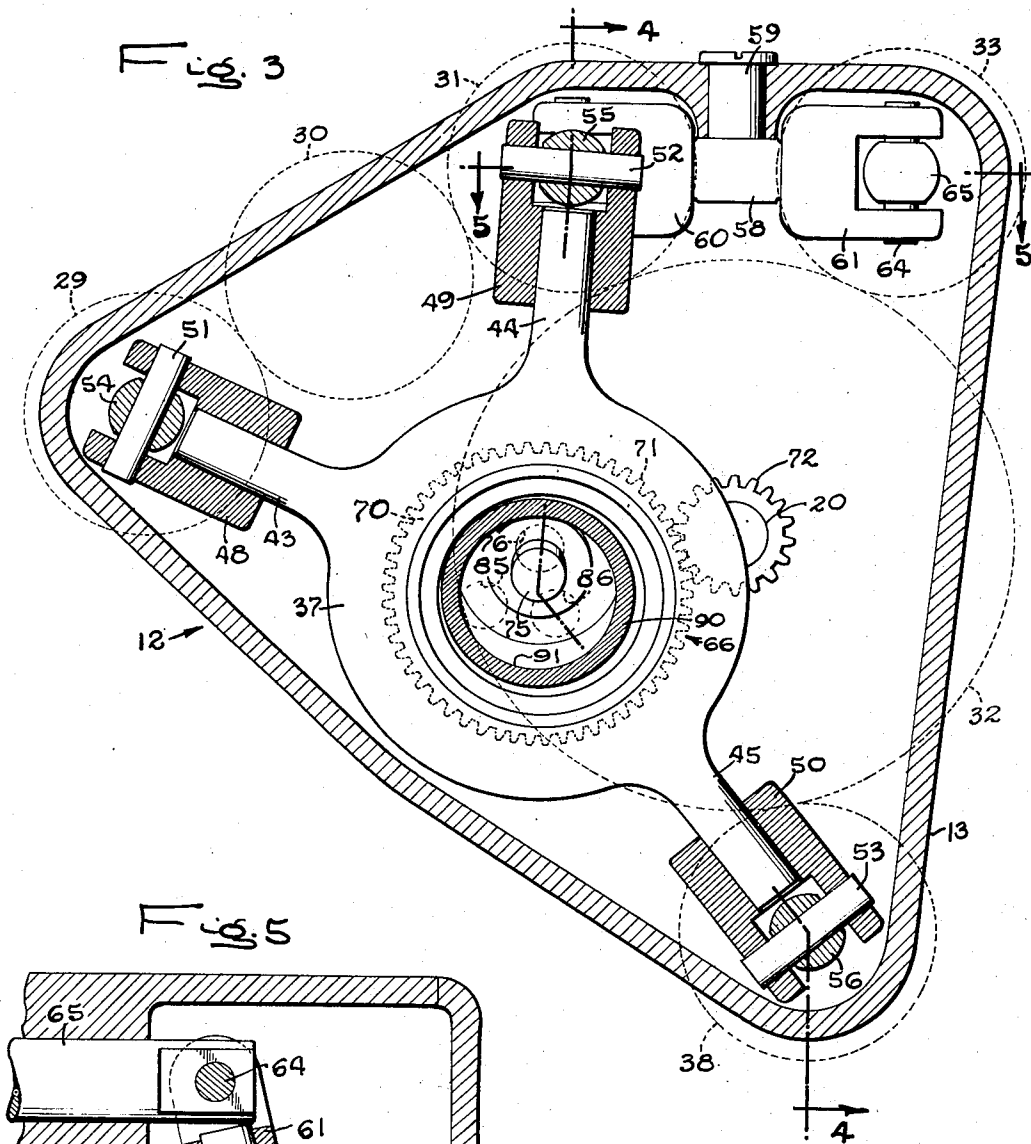
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3 Sheets-Sheet 2



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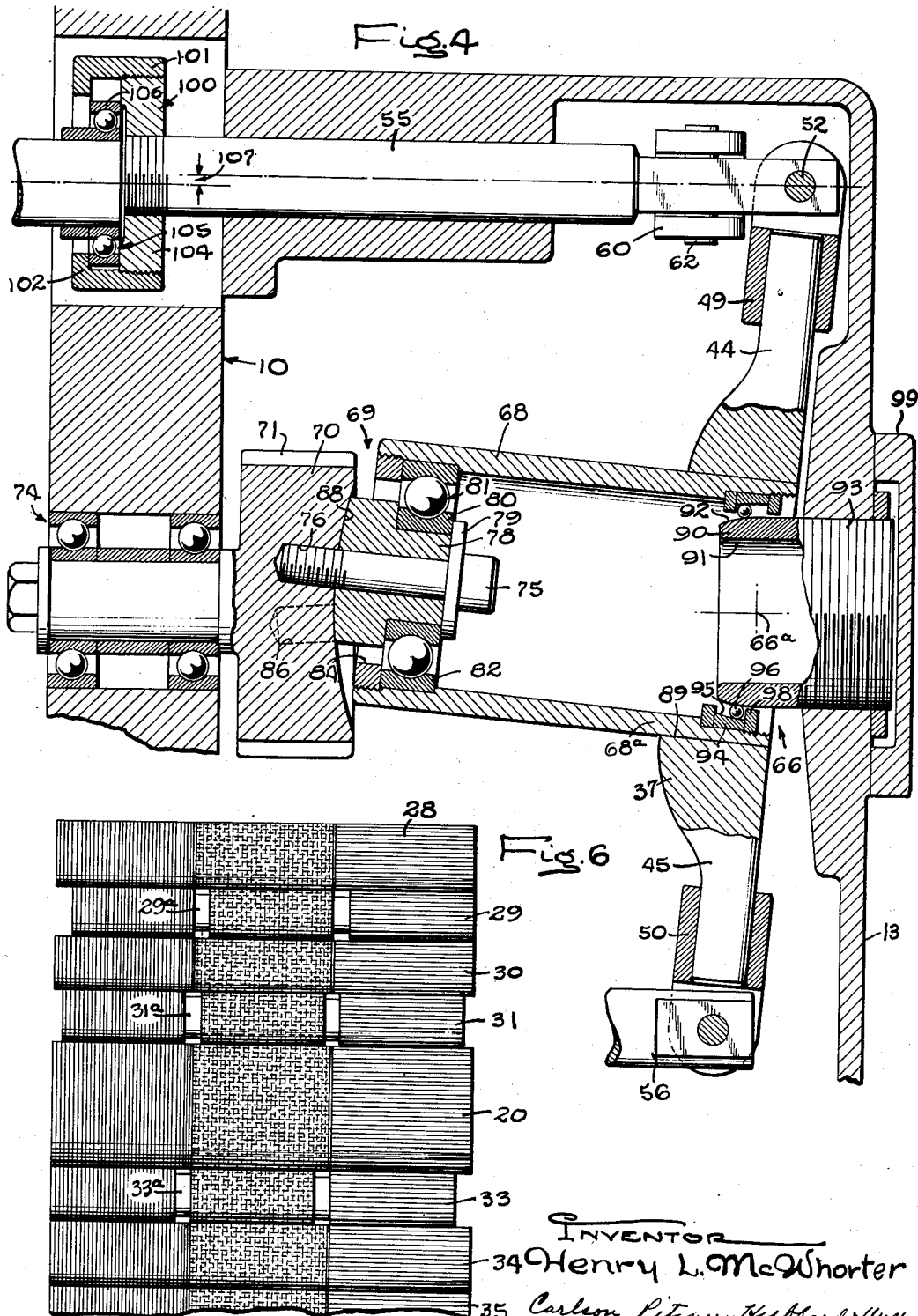
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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,581,687

INK ROLLER VIBRATOR

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a corporation of Illinois

Application October 16, 1947, Serial No. 780,284

9 Claims. (Cl. 101—348)

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The present invention relates to ink roller vibrators and in particular to a device for reciprocating the rubber ink distribution rollers on a printing press.

In copending application Serial No. 6734, filed February 6, 1948, assigned to a common assignee, there is disclosed an improved ink film distributing system in which the series of steel and rubber ink distribution rollers are engaged in a folded or clustered relationship and in which the rubber rollers are arranged for axial vibration to maintain a narrow stationary ink distribution strip between adjacent bands of ink film. It is a primary object of the present invention to provide an improved ink roller vibrator particularly adapted for reciprocating rubber ink distributing rollers which are arranged in a clustered relationship.

It is another object of the invention to provide an ink roller vibrating mechanism which is of unitary construction adapted to be driven by a drive shaft which is arranged generally centrally of a plurality of rollers to be vibrated. It is an allied object to provide an ink roller vibrator which can accommodate all of the vibrating rubber rollers employed in an ink distribution system of the type disclosed in the aforementioned copending application.

It is a further object of the device to provide a unitary roller vibrating mechanism which is compact and which may be constructed in a manner to closely hug the side of the ink carriage frame, resulting in less danger to operating personnel due to obstruction of the walkways, and contributing to the neat appearance of the press.

It is still another object of the invention to provide an ink roller vibration in which the friction and inertia load is minimized, resulting in an extremely low power requirement from the press drive. In addition, the power requirement remains substantially uniform throughout the cycle, resulting in uniform loads on the driving elements. It is a more detailed object to produce an ink roller vibrator in which the amplitude of vibration may be varied over wide limits without affecting in any way the balanced relationship of the parts and without requiring that the vibrator be disassembled to accomplish such adjustment. This and the other objects have been accomplished with a structure which is simple and straight-forward and which may be easily and inexpensively constructed.

It is a more detailed object of the present in-

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vention to provide a vibrating mechanism for at least three vibrating rollers in which the vibration of the rollers respectively is dissimilar in phasing and equal in amplitude and which may, at the same time, derive rotative power from a gear having an axis located at any position generally centrally of the rollers being vibrated.

Other objects and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary view of a portion of an ink carriage showing the improved vibrator mounted on one side thereof.

Fig. 2 is a more or less schematic view showing the relationship of the ink distributing rollers with particular emphasis on the vibrating rollers which may be drivingly accommodated by the mechanism herein disclosed.

Fig. 3 is a view of the vibrator looking in the direction of the roller axis and with the covering of the housing removed to show the details of construction.

Fig. 4 is a transverse sectional view of the vibrator of Fig. 3, taken along the line 4—4 thereof.

Fig. 5 is a fragmentary view of the auxiliary linkage included in the vibrator mechanism taken along the line 5—5 of Fig. 3.

Fig. 6 is a diagrammatic layout of the rollers in the ink distributing system showing the bands of colored ink film arranged side by side thereon.

While the invention is susceptible of various modifications and alternative constructions and uses, I have shown in the drawings and will hereinafter describe in detail one embodiment of the invention. It is to be understood, however, that I do not intend to limit the invention by such disclosure, but aim to cover all modifications and alternative constructions and uses falling within the spirit and scope of the invention as expressed in the appended claims.

Referring now to Fig. 1, there will be seen a portion of a magazine press ink carriage indicated generally at 10 having an improved ink roller vibrator 12 mounted thereon in a housing 13 and at the ends of the rollers to be vibrated. The series of steel and rubber rollers 14 serve to produce a smooth evenly distributed ink film for application to the plate cylinder 15 which is in rolling engagement with an impression cylinder 16 which carries the web of paper receiving the printed impression. As will be seen in greater detail, power is supplied to the vibrating mechanism via a vertical shaft 17 driving a horizontal shaft 18 through a pair of bevel gears 19. From

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the shaft 18 power is transmitted through a pair of bevel gears 21, a transverse roller shaft 20 and into the vibrator 12.

The relationship of the various rollers employed in the ink distribution system is clearly shown in Fig. 2, such rollers being arranged substantially as shown in the above mentioned copending application. Briefly stated, the ink distribution system includes a fountain 24 which may be of the continuous feed undershot type as set forth in detail in my copending application for U. S. Letters Patent Serial 762,580 filed July 22, 1947. This fountain applies a film of ink to a fountain roller 25 which has a "spiral" roller 26 in wiping engagement therewith. The portion of the ink removed from the fountain roller is next passed to a rubber roller 27 from which it is distributed to a relatively larger steel roller 28. From the latter the ink film is transferred to a first vibrating roller 29, a steel roller 30 and a second vibrating roller 31, both of the vibrating rollers 29, 31 being constructed of rubber and having grooves 29a, 31a, respectively formed therein for color separation purposes.

Next, the ink film is deposited on an ink drum 32 which rotates in a clockwise direction as illustrated, so that the film is to a large extent removed by a vibrating rubber roller 33, spaced about the periphery of the drum from the vibrating roller 31. The ink film which is picked up by the rubber roller 33 defines the "primary" path of ink flow to the plate cylinder. This primary path is completed through a steel roller 34 which is in rolling engagement with a first form roller 35 and a second form roller 36, both of which ride on the plate cylinder 15.

As the inking drum 32 rotates clockwise, the ink remaining thereon after contact with the roller 33 passes around the right-hand surface to a rubber roller 38 which constitutes the beginning of the "secondary" ink path. From the rubber roller 38 the ink flows to a steel roller 39, thence to a third form roller 40 and a fourth form roller 41. It will be noted that the rollers instead of being strung out in a serial arrangement are instead "folded" or "clustered" to form a pocket 42. It will be apparent that such clustered arrangement brings the rubber rollers 29, 31, 33, and 38 into close proximity to one another, the rollers being grouped generally around the shafts 20 of the ink drum 32.

Turning now to the detailed layout view of the vibrator 12 shown in Fig. 3, it will be seen that the vibrator includes a spider 37 having arms 43, 44 and 45 thereon. At the ends of the arms are couplings or joints 48, 49, 50 respectively, preferably of the shackle type and have shank portions allowing a limited amount of relative telescoping movement. Received in the joints 48, 49, 50, are wrist pins 51, 52, and 53. These serve to engage push rods 54, 55 and 56 respectively, which engage the shafts of the rollers 29, 31, and 38, subjecting each of them, as will be apparent, to a reciprocating motion.

The vibrating roller 33 is vibrated by being coupled to the push rod 55 serving to vibrate the roller 31. Thus, in Fig. 5 there will be seen a pivoted link 58 which is mounted for oscillatory movement about a pivot 59. At the ends of the lever 58 are additional shackle type joints 60, 61 which carry wrist pins 62, 64. The first joint 60, coupled to the push rod 55, transmits the motion of the latter, out of phase by 180 degrees, to an auxiliary push rod 65. The resulting "teeter-totter" action will be apparent from Fig. 5 which

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is a fragmentary sectional view of the lever 58.

In accordance with one aspect of the invention, means are provided for imparting a rotary wobbling movement to the spider 37. This is accomplished by mounting such spider on a universal joint or pivot 66 located centrally therein and by further providing a projection 68 extending inwardly toward the press from the spider and rigidly joined to the latter. At its inner end the projection 68 engages an eccentric indicated generally at 69, which is mounted on a rotatable driving member 70. In operation, the rotary movement of the eccentric 69 causes the inner end of the projection 68 to be drawn in a circular path and, since the spider 37 to which the projection 68 is connected is universally mounted for universal movement about a fixed point 66a, the entire spider will be caused to move with a rotational wobbling movement which is utilized to reciprocate the push rods 54, 55, and 56 out of phase with one another.

Referring to the rotary driving member 70 in greater detail, it will be seen that the outer periphery includes gear teeth 71 which mesh with the teeth of a driving pinion 72 (see Fig. 3) which rotates with the shaft 20 and the ink drum 32 mounted thereon. Rotation of the driving member 70 is facilitated by an antifriction bearing 74 which is mounted in the frame of the ink carriage.

In the practice of the present invention, the eccentric 69 is journaled in the projection 68 so that the latter members remain in a coaxial relation at all times and making it unnecessary to provide some complicated knuckle or ball and socket joint at this point. The coaxial relation of parts 68, 69 is maintained by causing the axis of the eccentric 69 to be angled with respect to the driving member 70 on which it is mounted, the axis of the eccentric in the present instance being aligned with the center of rotation 66a of the universal joint 66. Thus, regardless of the rotational position of the driving member, the eccentric is always in perfect journaled alignment with the projection 68. While the specific design of the eccentric may take many forms without departing from the important relationship just set forth, I prefer to use a stub projection which may be conveniently termed an angle post 75 and which may be threaded or otherwise eccentrically mounted in the driving member 70. As illustrated in the preferred embodiment of Fig. 4, the angle post 75 is received in a tapped hole 76. Surrounding the angle post 75 is a bushing 78 which, together with a washer 79, mount the inner race 80 of an antifriction bearing 81. The outer race 82 of this bearing is seated in the open inner end of the projection 68 and retained therein by a threaded collar 84 or the like.

The present invention is also concerned with varying the amplitude of roller vibration. For this purpose additional tapped holes, here indicated at 85 and 86 (Fig. 3), are provided in the rotary driving member 70 and located therein at a greater and lesser distance, respectively, from the center of rotation. Each of the holes 85, 86 is appropriately angled so as to be directed at all times at the center of rotation 66a of the spider 42, all in accordance with the teachings above set forth. In order to provide not only proper orientation but also firm seating for the bushing 78 surrounding the angle post 75, mating spherical surfaces 88 are machined on the rotary member 70 and on the inner surface of

the bushing. The center of such spherical surfaces is, in the practice of the invention, located at the point 66a which coincides with the center of universal wobbling movement of the spider 37. This enables the device to operate in exactly the same manner regardless of the degree of eccentricity, in other words, regardless of which of the holes 76, 85, 86 may be used. It will be apparent to one skilled in the art that the hole 85 having the greatest eccentricity will cause movement of the rollers through a greater amplitude, while the hole 86, having the least amount of eccentricity, corresponds to a reduced amplitude of vibration.

In accordance with another aspect of the present invention, the vibrator mechanism is so constructed as to provide access to the angle post 75 so that it may be unscrewed from one hole and screwed into another to change the amplitude of vibration. For this purpose the projection 68 is formed of a hollow sleeve which is rigidly engaged at its outermost end 68a in an aperture 89 formed in the central portion of the spider. Further, the universal mounting 66 is so constructed so as to enable access to the interior of the projection 68. The latter is achieved by employing a second or mounting sleeve 90 having a relatively large bore 91 therein. The inner end of the sleeve 90 has a spherical outer surface 92 which forms the "ball" portion of a ball and socket joint. The body portion of the mounting sleeve 90 is mounted in the outer wall of the vibrator housing 13. Preferably a thread 93 is used so that the mounting sleeve may be adjustably advanced to remove any play existing in the bearings of the spider mounting. Once the proper adjustment is obtained, it is preserved by a lock nut 97 or the like.

The socket portion of the ball and socket mounting includes an outer bearing race 94 having a spherical inner surface 95. A series of balls 96 riding thereon reduce friction to a minimum and permit rotary wobbling action of the spider 37 through the desired angle. Both the balls and outer race are retained in position by retaining rings 98 which may be pressed or screwed into position within the inner end of the projection 68.

In view of the foregoing it will be apparent that a construction is provided in which two sleeves 68, 90 having a large inner diameter are in general alignment permitting a tool, such as a wrench, screwdriver or the like to be inserted within them, to engage the top of the angle post 75. Thus it is merely the work of a few minutes to change the amplitude of vibration, which is to be contrasted with the conventional type of vibrator in which adjustment frequently requires partial disassembly. Preferably, a cover 99 is provided on the outside of the housing 13 to prevent the entry of dirt into the housing and to improve its appearance.

While the push rods 54, 55, 56 and 65 are mounted for pure reciprocating movement within the housing 13, nevertheless it is to be noted that this in no way restricts the lateral bodily adjustment of the rollers with which they are engaged. For example, referring to the upper portion of Fig. 4, it will be noted that the push rod 55 is reciprocatingly coupled to the shaft of the roller 31 through a joint 100 allowing lateral offset of the two axes. In the present instance the joint 100 includes an annular housing 101, the left-hand side of which carries an inwardly extending flange 102. The opposite or right-hand side of

the coupling 100 is closed by a threaded flange-like collar 104. In the space between the collar 104 and the flange 102 is an antifriction bearing 105 which has an outer race 106 which is free to slide laterally through a limited distance in any direction. Consequently the axes of the roller and push rod respectively may be offset, for example to the extent indicated at 107.

While the angular relationship of the spider arms 43—45 is an important factor in the smoothness of mechanical operation, it will be understood that the phasing of the rollers with respect to the ink film depends upon an additional factor, namely, upon the distance through which the ink film moves during the phasing time interval between adjacent rollers. The latter is best illustrated by taking an extreme case. Suppose, for example, that the ink film were transported at such speed between adjacent vibrating rollers so that it moved, in the phasing time interval, exactly from one of the rollers to the next. This would be undesirable since the ink at a given point on the ink path would be laterally wiped by the second roller in exactly the same manner and in the same vector direction as it had been wiped by the first. It is desirable, rather, for the ink at a given point in the ink path to be acted upon in an unlike manner by successive rollers.

In designing an ink distribution system for use with the present ink vibrator, it is helpful to assume a desired peripheral speed for the ink drum, the latter corresponding to the speed of transport of the ink film. As the next step, the vibrating rollers may be arranged about the ink drum, and, in addition, at a separate point in the ink distribution system as shown in the drawings, and in particular Figs. 3 and 6. Assuming that an equal amplitude of vibration is desired for each of the vibrated rollers, the center of wobbling movement is chosen to make each of the spider arms the same length. The latter serves to locate the center of the driving member which is the rotating member 70 in the drawings. As a final step, the driving ratio between the power source (shaft 20) may next be determined by adjusting the ratio between the number of teeth on the meshed gears 71, 72. The driving ratio thus chosen determines the frequency of vibration of the rollers and thus establishes the distance that the ink film moves in the phasing time interval between the adjacent rollers. As stated above, the driving ratio should be chosen so that each roller acts in turn upon the ink film in a manner which differs in phasing.

While the design set forth in the patent drawings has been found to produce the desired out-of-phase wiping of the ink film, it will be apparent to one skilled in the art that other specific roller layouts may be employed without departing from my teachings. As a matter of fact the basic vibrator mechanism may be employed to advantage in substantially any ink distribution system employing vibrating rollers which are arranged in more or less clustered formation.

Résumé of operation

Although the operation of the improved vibrator will for the most part be apparent from the foregoing description, it may be summarized briefly as follows. Rotation of the driven member 70 caused by the driving pinion 72 with which it is engaged causes the eccentric 69 to move in a circular path about the axis of rotation. During the course of such movement the inward projection 68 on the spider 37 is constrained to

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wobble in unison with the eccentric about the center 66a of the universal mounting 66. Since the projection 68 moves in a circular path, the wobbling motion which is imparted to the spider 37 will also be of a rotary nature. Thus, the push rods which are engaged by the arms of the spider are reciprocated in a predetermined phase relationship, the difference in phasing with respect to the moving ink film being proportional to both the angular positioning of the respective arms and the corresponding travel of the ink film as set forth above. Since the arms are vibrated by a common mechanism in register with the press drive, it is impossible for the rollers to change their relative phasing. Thus, the pattern of film vibration initially incorporated into the press is automatically maintained regardless of the speed of press operation.

I claim as my invention:

1. In an ink roller vibrator for a printing press having reciprocally mounted ink rollers, the combination comprising a spider having arms thereon adapted to reciprocatingly engage said ink rollers, a universal mounting for said spider to enable it to wobble freely in any direction about a central axis which is parallel to the axes of said ink rollers, an axial projection on said spider and rigidly joined thereto at the generally central portion thereof, and means including a rotative driving member having an eccentrically mounted post in engagement with the end of said extension, said rotative member being substantially in alignment with the axis of said universal coupling for bodily rotation of the end of said projection about said central axis for imparting a rotary wobbling motion to said spider.

2. In an ink roller vibrator for a printing press having reciprocally mounted ink rollers arranged about a central point, the combination comprising a spider having arms thereon for reciprocatingly engaging said ink rollers, a rigid projection on said spider located at the central portion thereof and extending inwardly toward said printing press, a rotative driving member in general alignment with said projection, an eccentric on said rotatable member disposed for engagement with the inwardly extending end of the projection on said spider and imparting circular bodily movement to said end of said projection, and a universal mounting means bearing against the opposite end of said projection and restraining it against movement away from said eccentric.

3. In an ink roller vibrator for a printing press having reciprocally mounted ink rollers, the combination comprising a spider having outwardly extending arms thereon for reciprocatingly engaging said ink rollers, a ball and socket mounting for said spider positioned for limited universal movement of said spider about an axis centrally of the latter, a rotative driving member in general alignment with said axis centrally of the spider and axially spaced from the latter, an eccentric post on said rotatable member, a rigid projection on said spider in journaled engagement with said eccentric post, said eccentric post being angled in the direction of the center of said ball and socket mounting so that said spider is subjected to a wobbling motion upon rotation of said driving member.

4. In an ink roller vibrator for a printing press having reciprocally mounted ink rollers, the combination comprising a spider having arms thereon for reciprocatingly engaging said ink rollers, a rigid sleeve projection on said spider located at the central portion thereof, and extending in-

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wardly toward said printing press, a universal mounting for said spider, said mounting being positioned centrally of said spider and in alignment with said sleeve projection for limited universal movement of said spider about an axis parallel to the axis of the ink rollers, a rotative driving member in general alignment with the axis of said universal movement, an eccentric post on said rotatable member in journaled engagement with the sleeve projection on said spider, said universal mounting being so constructed as to provide access into said sleeve projection for enabling the adjustment of the degree of eccentricity of said post.

5. In an ink roller vibrator for a printing press having reciprocally mounted ink rollers, the combination comprising a spider having arms thereon for reciprocatingly engaging said ink rollers and having an aperture centrally arranged therein, a sleeve rigidly fixed on said spider in alignment with said aperture and extending inwardly toward said printing press, means for supporting said spider including a mounting sleeve aligned with said first mentioned sleeve and having a spherical surface thereon for ball and socket engagement with said spider, a rotative driving member in general alignment with the sleeve on said spider, an eccentric post on said rotatable member in journaled engagement with the sleeve on said spider, so that said spider is subjected to a rotary wobbling motion about its ball and socket mount upon rotation of said driving member, said sleeves forming a continuous access channel for enabling adjustment of the degree of eccentricity of said post.

6. In an ink roller vibrator for a printing press having reciprocally mounted ink rollers, the combination comprising a spider having arms thereon for reciprocatingly engaging said ink rollers, means for mounting said spider for universal movement about a point located generally centrally therein, a rigid projection on said spider having an axis generally aligned with the center of movement thereof and extending inwardly toward said printing press, a rotative driving member in general alignment with said projection, an eccentric on said rotatable member mounted for rotation relative thereto, said eccentric also being disposed for journaled engagement with said projection for subjecting said spider to a rotary wobbling motion upon rotation of said driving member, and means for variably positioning said eccentric on said driving member for different amounts of eccentricity, said positioning means being so constructed that the rotational axis of said eccentric relative to said rotatable member is aligned with the center of wobbling movement of said spider regardless of the degree of eccentricity.

7. In an ink roller vibrator for a printing press having reciprocally mounted ink rollers, the combination comprising a spider having arms thereon for reciprocatingly engaging said ink rollers, means for mounting said spider for universal movement about a point located generally centrally therein, a rigid projection on said spider having an axis generally aligned with the center of movement thereof and extending inwardly toward said printing press, a rotative driving member in general alignment with said projection, an eccentric post on said rotatable member in journaled engagement with said projection for subjecting said spider to a rotary wobbling motion upon rotation of said driving member, and a concave surface on said driving member for adjust-

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ably positioning said post thereon for different amounts of eccentricity, said surface being formed so that the axis of said post is alined with the center of wobbling movement of said spider for all positions of eccentric adjustment.

8. In an ink roller vibrator for a printing press having reciprocably mounted ink rollers, the combination comprising a spider having arms thereon adapted to reciprocatingly engage said ink rollers, a universal mounting for said spider to enable it to wobble in all directions about a central axis which is parallel to the axis of said ink rollers, a rotative driving member in axial alinement with said central axis, and an eccentric mounted on said driving member and axially spaced from said universal mounting, a rigid member interposed between said eccentric and said spider, one end of said rigid member being in journaled engagement with said eccentric and the other end thereof being rigidly attached to said spider for imparting a wobbling motion to the latter, said arms having equal radii with respect to said central axis so as to cause said rollers to vibrate respectively out of phase but with equal amplitude.

9. In an ink roller vibrator for a printing press having reciprocably mounted ink rollers, the combination comprising a rotative driving member

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having an eccentric thereon and having its axis parallel to the axes of said ink rollers, a rigid member having one end portion journaled on said eccentric, a universal mounting in engagement with the second end portion of said member for permitting limited swinging movement of said member in any direction about a center in general alinement with the axis of said rotative drive member, a spider having arms thereon for reciprocatingly engaging said ink rollers, said spider being rigidly connected to the second end portion of said rigid member and positioned relative thereto such that said arms are generally perpendicular to said rigid member.

HENRY L. McWHORTER.

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