(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 510 962 A1**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **92303644.6**

(51) Int. Cl.^{5}: **B41F 31/14**

(22) Date of filing: **23.04.92**

(30) Priority: **24.04.91 US 690595**

(43) Date of publication of application:
28.10.92 Bulletin 92/44

(84) Designated Contracting States:
DE FR GB IT SE

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(54) **Internal worm drive and oscillating roller assembly for use in dampening system for lithographic printing presses.**

(57) An internal worm drive suitable for use for or with a dampening roller in a lithographic dampening system has a worm gear and a substantially hollow tubular worm with an outer surface and an inner surface. The inner surface has at least one internal worm thread mating the worm gear. The axis of the worm gear is substantially perpendicular to the longitudinal axis of the tubular worm. Utilizing the tubular worm with the threaded internal surface in conjunction with the mating worm gear is an oscillating roller assembly suitable for use as a dampening roller in lithographic presses. The oscillating roller assembly has a shaft, and a bearing unit mounted along the shaft. A worm gear having a plurality of teeth is contained in a slotted space in the bearing unit and the shaft such that the rotational axis of the worm gear is substantially perpendicular to the longitudinal axis of the bearing unit and the shaft. The slotted space has first and second opposite longitudinal ends within the shaft. A pair of substantially coaxial eccentric cams are integrally affixed to opposite surfaces of the worm gear. The cams alternately engage the shaft at the opposite ends of the slotted space. A roller shell having at least one internal thread is circumferentially mounted around the bearing unit such that its internal thread engages the teeth of the worm gear. Rotation of the roller shell causes the worm gear to rotate, thereby causing the cams to alternately engage the shaft at the opposite ends of the slotted space, thereby causing the bearing unit and roller shell to oscillate back and forth along the shaft.

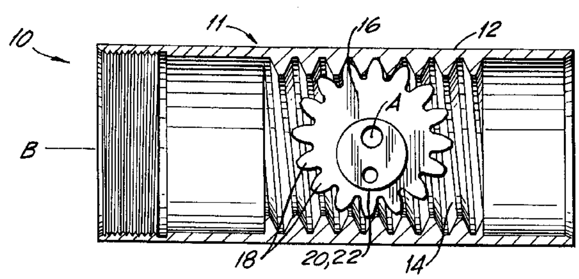

Fig. 1

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The present invention relates to a novel internal worm drive and also to an oscillating roller assembly for use in dampening systems in printing presses.

A large majority of the continuous type dampening systems in use today with lithographic printing presses utilize the "squeeze roll" principle to meter out a thin film of dampening fluid, which is then further thinned before being transported and applied to the plate cylinder on the press. In this method of metering, a hard surfaced roller and a compliant surfaced roller are forced into contact with one another, and one of the rollers is partly immersed in a pan or tray containing dampening fluid. This roller pair is geared together and connected to a motor drive which causes the two rollers to turn in counter rotating directions. Dampening systems utilizing this metering principle are frequently either of the "three-roll" type or of the "four-roll" type.

For example, Figures 5A and 5B show two different configurations which are currently used in three-roll continuous type dampeners, in which none of the dampening rollers are equipped with mechanisms for oscillating or vibrating them in the axial direction.

The configurations shown in Figures 5A and 5B comprise a pan 112 containing dampening fluid 113 and a pan roller 110 immersed in the fluid 113. In Figure 5A the roller 110 is a rubber pan roller which forms a flooded metering nip 114 with a chrome transfer and metering roller 116. A non-metering slip nip 118 is formed between the roller 116 and a form roller 120. In Figure 5B the roller 110 is a chrome pan roller and the roller 116 (forming the metering nip 114 with the roller 110) is a rubber metering roller. In Figure 5B the form roller 120 makes a non-metering slip nip 118 with the roller 110. The two configurations shown in Figures 5A and B possess common metering nip characteristics. That is, the roller 110 immersed in the pan 112 carries an excess of dampening fluid to the metering nip 114, which results in the nip becoming flooded and the excess fluid falling back into the pan. Figure 6 illustrates a typical four-roll type continuous dampening system such as described in U.S. Patent 4,887,533, which contains one roller which is equipped with a mechanism for oscillating it in the axial direction.

In Figure 6 a pan 212 contains dampening fluid 213 and a chrome pan roller 210 is immersed in the fluid 213. A flooded nip 214 is formed between the roller 210 and a rubber slip roller 216. A non-metering slip nip 218 is formed between the roller 216 and an oscillating chrome roller 219 which also forms a nip with a rubber form roller 220. The latter also forms a nip with a plate cylinder 222.

A problem sometimes encountered in printing with the lithographic printing press is the appearance of streaks or lines in the printed or image areas. Typically, these streaks occur in the direction of paper travel, and they may appear as a single line, or in a regularly spaced pattern of lines, such as in corduroy fabric. A common cause of such streaks on presses equipped with continuous-type dampening systems is the lack of, or an insufficient number of, rollers in the dampening system that are equipped with mechanisms for oscillating the rollers in the axial direction.

Thus, the performance of the prior art dampening systems shown in Figures 5A, 5B and 6 is often unsatisfactory because of ghosting and/or streaks which occur in the printed matter being produced. These problems, which may be aggravated by the use of alcohol substitutes in the dampening fluid, can often be alleviated by adding mechanisms to oscillate one of the rollers.

U.S. Patents 4,887,533 and 4,777,877 describe the streaking and ghosting problems attendant with printing with the lithographic press and disclose a method for providing an oscillatory motion to the dampening form roller to alleviate these problems. In this concept, the oscillatory motion is provided by slaving the roller to a mating roller which has an oscillating drive. Thus, this prior art method requires that the dampening system be already equipped with at least one roller which has an oscillating drive mechanism. Consequently, this prior art method cannot be used on typical existing three-roll dampeners, shown in Figures 5A and 5B, which are not so equipped. In addition, use of this prior art concept in the form roller position of four-roll type dampeners, of the type shown in Figure 6, may result in the generation of horizontal streaks, i.e., streaks perpendicular to the direction of paper travel. This can come about because of the stop used to limit the oscillatory stroke of the slaved roller, and is due to the abrupt change in speed which occurs when a stop is reached.

Another method which can be used to provide oscillatory motion to a dampening system roller is to add a mechanism coupled to the press drive which is capable of imparting such motion. However, if oscillating drive mechanisms are incorporated into a press after it has been operated for some time, because of the space limitations it is generally not possible to utilize the proven worm drive concept with such a mechanism.

Thus, it is generally necessary to use mechanisms which are self-contained within the roller. Generally, the self-contained mechanisms for generating an oscillating motion in the axial direction of the printing press roller have all utilized some form of a barrel cam. This basic mechanism consists of a rotating cylindrical cam which imparts some type of axial motion to a cam follower. These mechanisms can be characterized further according to the three types of cam surfaces employed: continuous single revolution barrel, continuous duplex or cross threaded, and dual discontinuous cam surfaces of opposite lead.

The most straightforward mechanism is the single barrel type, where a barrel cam is mounted on the inside of the roller and one or more followers are secured to the non-rotating roller shaft. Alternately, the cam can be mounted on the shaft and the follower(s) on the roller.

In the known devices, exemplified by U.S. Patent No. 3,110,253, one cycle of axial oscillatory motion is generated for each revolution of the roller. However, at high press speeds the rapid oscillatory motion produced by this design can cause unwanted streaks in the printed product.

To correct this problem, some designs have utilized gears internally and externally to reduce the relative rotational speed of cam and follower, thereby slowing down the axial oscillatory motion. U.S. Patent No. 2,040,331 is an example of such a device where the gears are located inside the roller. U.S. Patent No. 4,397,236, on the other hand, is an exemple of where the gears are located external to the roller.

The second type of device also uses a continuous cam having a multirotational surface. Such a cam is known as a duplex or cross-threaded cam and is exemplified by the cams disclosed in U.S. Patent Nos. 715,902 and 4,040,682. In these designs, several revolutions of the roller are required to produce one cycle of oscillatory motion. One problem encountered with this type of prior art device is that the mechanism is prone to jam as a result of wear.

In the third type of mechanism, disclosed for example in U.S. Patent Nos. 1,022,563 and 4,833,987, two discontinuous cam surfaces of opposite lead are employed. Oscillatory motion is provided by using two cam followers each of which alternately engages and disengages one of the cam surfaces. One problem encountered with these designs is excessive wear at high press speeds and resultant malfunctioning.

Thus, prior known internal mechanical devices have experienced problems such as mechanical wear for one reason or another. One reason for mechanical wear is that the force needed to produce the axial motion is generated at the contact point between the cam and follower. Wear can result at this point. In those designs which do not utilize gears, the relative speed of the follower is very high relative to the cam. In those designs which employ internal gears, the gears must be small enough to fit inside the roller. As a result, the gears must travel at relatively high speeds which may result in excessive wear after extended use.

Therefore, a significant problem encountered with all prior art self-contained designs for use in printing presses is poor reliability resulting from excessive mechanical wear, especially at high press speeds. Another problem with many prior art devices is that they are not compact enough to be used in certain locations in the press. A third problem with some prior art designs is that the oscillatory motion produced is not pure harmonic, i.e. is not sinusoidal.

Therefore, there presently exists a need for a self-driven oscillating roller which utilizes a worm drive mechanism compact enough to fit inside such a roller, and thus significantly reduces or avoids the aforementioned problems associated with the devices currently utilized in the art.

One of the various objects of the present invention is to provide an improved dampening system for lithographic printing presses.

Another of the various objects of the present invention is to provide an internal worm drive means for use in a dampening roller.

In one aspect the invention may be considered to provide a dampening system for lithographic printing presses, a dampening roller provided by an oscillating roller assembly comprising:

a. a shaft;

b. a bearing unit mounted along said shaft;

c. a worm gear having a plurality of teeth, said worm gear being disposed in a slotted space in said bearing unit and said shaft such that the rotational axis of said worm gear is substantially perpendicular to the longitudinal axis of said bearing unit and said shaft, said slotted space having first and second opposed ends within said shaft;

d. a pair of substantially coaxial eccentric cams integrally affixed to opposite surfaces of said worm gear, said cams alternately engaging said shaft at said opposite ends of said slotted space; and

e. a roller shell having a least one internal thread circumferentially mounted around said bearing unit such that said internal thread engages said teeth of said worm gear whereupon rotation of said roller shell causes said worm gear to rotate, thereby causing said cams to alternately engage said shaft at said opposed ends of said slotted space, thereby causing said bearing unit and said roller shell to oscillate along said shaft.

In another aspect the invention may be considered to provide a dampening roller in a lithographic dampening system comprising an internal worm drive means which comprises a worm gear and a substantially hollow tubular worm having an outer surface and an inner surface, said inner surface having at least one internal worm thread engaging said worm gear.

A preferred worm drive means in accordance with the invention is particularly adapted for dampening systems in lithographic presses and utilizes an internal worm in conjunction with a mating worm gear. The preferred worm drive means is suitably used to provide an oscillating dampening system roller assembly.

In a preferred embodiment of the invention a self-contained roller drive mechanism generates a pure harmonic motion in the axial direction.

Preferred oscillating dampening roller assemblies in accordance with the invention are rugged and reliable, compact and can be manufactured at low cost.

The above and other objects are achieved in a preferred embodiment of the invention by providing an internal worm drive means, which includes a worm gear and also a substantially hollow tubular worm having an outer surface and an inner surface. The inner surface of the tubular worm has at least one internal worm thread engaging the worm gear. The axis of rotation of the tubular worm is substantially perpendicular to the axis of rotation of the worm gear. Rotation of the tubular worm about its axis causes the worm gear mated with the internal worm threads of the inner surface of the tubular worm to rotate about its axis.

Also provided is an oscillating roller assembly suitable for use as a dampening roller, which utilizes the internal worm drive described above. The oscillating roller assembly has a shaft and a bearing unit mounted along the shaft. The shaft and the bearing unit are substantially coaxial. A worm gear having a plurality of teeth is disposed in a slotted space in the bearing unit and the shaft such that the rotational axis of the worm gear is substantially perpendicular to the longitudinal axis of the shaft and the longitudinal axis of the bearing unit. The slotted space containing the worm gear has first and second opposite longitudinal ends in the shaft. A pair of substantially coaxial eccentric cams are integrally affixed to opposite surfaces of the worm gear. A roller shell having at least one internal thread is circumferentially mounted around the bearing unit such that the internal thread of the roller shell engages the teeth of the worm gear. Rotation of the roller shell about its longitudinal axis causes the worm gear to rotate about its axis, thereby causing the cams affixed thereto to alternately contact the opposite longitudinal ends of the slotted space in the shaft. As the cams alternately contact the opposite ends of the space in the shaft, the bearing unit oscillates back and forth along the shaft. As the bearing unit oscillates, it also causes the roller shell to oscillate back and forth along the shaft in substantial unison with the bearing unit.

Advantageously, a preferred self-driven oscillating roller according to the invention can be used in any one of the three positions in a three-roll type dampener to eliminate streaks and to facilitate the use of alcohol substitutes in fountain solution. In addition, it can be used in the form roller position of a four-roll type dampening system, with the advantage that the harmonic oscillatory motion generated by its drive mechanism will avoid the generation of horizontal streaks. It can, of course, also be used in either of the two other positions, i.e., the metering roller or transfer roller positions that are available in this type dampener. Thus, the roller described here finds use in all types of dampening systems in use.

There now follows a detailed description to be read with reference to the accompanying drawings of a worm drive means embodying the invention.

Fig. 1 is an exposed side view of an internal worm drive embodying the present invention.

Fig. 2 is an exposed top view of an oscillating roller assembly embodying the present invention.

Fig. 3 is a cross-sectional view of the oscillating roller assembly shown in Fig. 2 taken through line 2′-2′.

Fig. 4A is an exposed side view of the oscillating roller assembly shown in Fig. 2.

Fig. 4B is a second exposed side view of the oscillating roller assembly shown in Fig. 2.

Figs. 5A and 5B illustrate two types of three-roll dampening systems currently in use with lithographic printing presses.

Fig. 6 is an example of a four-roll dampening system currently in use with lithographic printing processes.

Referring now to the drawings, in which like numerals indicate like components, Fig. 1 is a cross-sectional cut-away view of an internal worm drive means 10 according to one embodiment of the present invention. The internal worm drive means includes a tubular worm 11. The tubular worm is manufactured from any substantially rigid and durable material known in the art. Preferably, the tubular worm 11 is made of metal or metal alloy; most preferably, steel. The outer diameter of the tubular worm 11 can vary according to the uses for which it will be put. The tubular worm 11 has an outer surface 12 and an inner surface 14. The inner surface 14 of the tubular worm 11 is threaded in either a right- or left-handed manner. It is preferred that the active surface of the inner threaded surface 14 have a surface finish of not greater than about 24 microinches (about 6.1 x 10^{-4}mm). while the inner surface 14 of the tubular worm 11 is shown in Fig. 1 with a single thread, it is also within the scope of the invention that the inner surface have a double threaded worm.

Also shown in Fig. 1 is a worm gear 16 which is provided as part of the internal worm drive means 10. The worm gear 16 has a plurality of teeth 18. Each tooth of the worm gear 16 will engage the threads on the inner surface 14 of the tubular worm 11. As the tubular worm 11 rotates about its longitudinal axis "B", its thread on the inner surface 14 will engage each tooth 18 of the worm gear 16, thereby causing the worm gear 16 to rotate about its transverse axis through its center "A". The axis of rotation of the worm gear 16 is substantially perpendicular to the longitudinal axis of rotation of the tubular worm 11 of the internal worm drive 10. Like the tubular worm 11, the worm gear 16 is also preferably made from a durable alloy such as, for example, case hardened steel. It is especially desirable that the active surface of the worm gear teeth 18 have a surface finish of not greater than about 32 microinches.

The worm gear 16 may additionally have eccentric cams 20, 22 integrally affixed to its opposite surfaces. Fig. 1 shows one of the cams. The second cam would be mounted to the worm gear 16 on the opposite side. The two cams would preferably be substantially coaxial. The cams 20, 22 attached to the worm gear 16 will drive additional components hereinafter to be described.

Referring now to Figs. 2 through 4, there is shown an oscillating roller assembly 24. As that term is used herein, the word "oscillating" refers to reciprocating motion along an axis, for example the axis "B". The oscillating roller assembly 24 utilizes the aforementioned novel internal worm drive concept typified by the tubular worm 11 in conjunction with the internal worm gear 16/dual eccentric cam 20, 22 combination shown in Fig. 1. A substantially circular shaft 26 is provided for mounting a bearing unit 28. The shaft is preferably a "dead" shaft, with no rotational, lateral or longitudinal motion. The opposite ends of the shaft can be mounted to another structure (not shown). The bearing unit 28 is disposed along the shaft 26. The bearing unit 28 is also substantially circular and substantially coaxial with the shaft 26. The shaft 26 may have an optional axial oil hole for filling and recirculation of oil.

Housed within the bearing unit 28 and shaft 26 is a worm gear 29 having the plurality of teeth 30. Worm gear 29 and teeth 30 correspond to the worm gear 16 and teeth 18 shown in Fig. 1. The worm gear 29 is mounted and contained in slotted space 31 cut or machined, for example, out of the bearing unit 28 and shaft 26. Points 31A and 31B in Fig. 3 represent the transverse boundaries of slotted space 31, while points 31C and 31D represent the upper and lower boundaries. The worm gear 29 is mounted so as that its rotational axis about the point "A" (through the center of the worm gear) is substantially perpendicular to the longitudinal axis of the shaft 26 about the point "B". Point "B" also represents the longitudinal axis of the bearing unit 28. The worm gear 29 may have a right or left hand helm. In any event, the helix hand of the worm gear 29 will be equal and opposite to that of the threaded inner surface of the roller shell hereinafter described. In one embodiment of the invention shown in Figs. 2 through 4, the helix angle is about 3.14 degrees.

The worm gear 29 is preferably made from a durable metallic alloy. Manganese bronze is one material for the worm gear, but most preferably the material is a steel alloy. While the worm gear 29 may have any number of teeth, it is desirable that the gear have about sixteen teeth. The worm gear preferably also has a tooth-to-tooth composite error of not greater than about 0.01 inches and a total composite error of not greater than about 0.002 inches. It is especially preferred that the active surface of the worm gear teeth 30 have a surface finish of not greater than about 32 microinches. Also especially preferred is the hardness of the worm gear, which should preferably be in the range of about R_c 55 - 60 ("Rockwell C").

As shown in Fig. 3, the worm gear 29 is mounted in the slotted space 31 in the bearing unit 28 and shaft 26 by a pair of needle bearings 32, 33 pressed through the central bore "A" of the worm gear 29. The worm gear needle bearings 32, 33 surround a dowel pin 34 also mounted through the shaft 26 and bearing unit 28. The dowel pin 34 is further supported by a pair of standard drill bushings 35A and 35B. The drill bushings are positioned through the shaft 26 and prevent worm gear rotation and deflection about the axis "B". The drill bushings 35A, 35B are also pressed into the bearing unit 28 to allow the bearing unit 28 to move axially as the down pin 34 moves. Others means of mounting the worm gear 29 may occur to those skilled in the art, and are certainly within the scope of the invention.

As shown in Figs. 4A and 4B, the bushings 35A and 35B ride in a longitudinal groove 36 in the Shaft 26. The longitudinal groove 36 has endpoints 36A and 36B. As shown in Fig. 3, the longitudinal groove 36 extends the full transverse width of the shaft 26 through the slotted space 31.

As shown in Figs. 2 and 3, there are integrally affixed to the opposite surfaces of the worm gear 29 a pair of substantially coaxial eccentric cams 39 and 40. Figs. 4A and 4B show one of the cams 39. Cams 39 and 40 correspond to the cams 20 and 22 shown in Fig. 1. Cams 39 and 40 can have substantially identical diameters will about 0.0005 inches. The cams 39, 40 will alternatively contact the shaft 26 at points 41A, 41B and 42A, 42B shown in Fig. 2. Points 41A, 41B and 42A, 42B are at longitudinal opposite ends of the slotted space 31, respectively. Figs. 4A and 4B show points 41A and 42A. Contact points 41A and 42A are substantially coplanar, while points 41B and 42B are substantially coplanar. Endpoints 36A and 36B of longitudinal groove 36 extends slightly beyond the contact points 41A, 41B and 42A, 42B, respectively, in the longitudinal direction.

Circumferentially disposed around the bearing unit 28 and shaft 26 is a roller shell 44 which corresponds to the tubular worm 11 shown as part of the internal worm drive 10 in Fig. 1. The roller shell 44 is substantially coaxial with the bearing unit 28 and the shaft 26. The roller shell 44 is shown with an outer surface 45 and an inner surface 46. The outer surface 45 may be plated or may be covered will a covering material. If the outer surface 45 is plated, then it should be smooth and preferably machine-ground. If the outer surface 45 is covered with an optional cover 47 mae of rubber or other material, the outer surface may be rough.

The inner surface 46 of the roller shell 44 is internally threaded. The threading of the inner surface 46 can be right-handed or left-handed, and is opposite to that of the worm gear 29. The thread of the inner surface 46 engages the teeth 30 of the worm gear 29. As previously mentioned, it is preferred that the surface of the inner threaded surface 46 have a surface finish of not greater than about 24 microinches. The threaded inner surface should also preferably have a hardness in the range of about R_c 62 - 70.

As the roller shell 44 is rotated about the longitudinal axis "B", the internal thread of the inner surface 46 of the roller shell 44 engages the teeth 30 of the worm gear 29 and thereby drives the worm gear about its axis "A". As the worm gear turns, the pair of eccentric cams 39 and 40 attached to the worm gear alternately contact points 41A, 41B and 42A, 42B, respectively, and thereby cause the bearing unit 28 to oscillate back and forth along the shaft 26 in a forward and reverse axial direction. In Fig. 2, points 41A, 41B and 42A, 42B are shown inside the space 31. Figs. 4A and 4B show a side view of points 41A and 42A along the dotted line. Thus, the rotational motion of the worm gear 29 is translated into the reciprocating axial motion of the bearing unit 28 along the shaft 26. The reciprocating motion of the bearing unit 28 causes the roller assembly 44 to oscillate back and forth along the shaft in substantial unison with the bearing unit.

In Fig. 4A, the teeth 30 of the worm gear 29 are shown engaging the threaded inner surface 46 of the roller shell 44. The central bore "A" of the worm gear 29, occupied by the needle bearings 32, 33 and the dowel pin 34, is shown at a position in the longitudinal groove 36 approximately half way between points 36A and 36B. In Fig. 4B, eccentric cam 39 is shown contacting the shaft 26 at point 41A. Eccentric cam 40 would further contact the shaft 26 at point 41B such that points 41B and 42B would be substantially coplanar in the transverse direction.

In Figs. 4A and 4B, rotation of the roller shell 44 causes the teeth 30 of the worm gear 29 engaged by the threaded inner surface 46 to turn about point "A". This in turn causes the eccentric cam combination 39 and 40 to rotate about the point "A". As the cams 39, 40 turn about point "A", the worm gear 29 moves longitudinally along the groove 36 until it approaches end position 36B as shown in Fig. 4B. At the same time, eccentric cam 39 contacts the shaft at point 41A and cam 40 contacts the shaft at point 41B, thereby causing the bearing unit 28 to move axially along the shaft 26 in one direction. Continued rotation of the roller shell 44 will cause the point "A" of the worm gear 29 to move in a reverse direction from end point 36B through the center of groove 36 until point "A" approaches end position 36A. At the same time, cam 39 will contact point 42A on the shaft and cam 40 will contact point 42B, thereby causing the bearing unit to move in the opposite axial direction. Thus, as the roller shell 44 rotates or turns, point "A" of the worm gear 29 will move back and forth between end points 36A and 36B of groove 36. At the same time, cams 39 and 40 will alternately contact point 41A, 41B and 42A, 42B on the shaft, respectively, thereby causing the bearing unit 28 to oscillate along the shaft 26. The roller shell 44 will also oscillate in substantial unison with the bearing unit 28.

Those skilled in the art may find other ways of translating the rotational motion of the worm gear 29 into the oscillating motion of the bearing unit 28. For example, a pair of crank arms could be pinned at one end to the shaft, while their otherends are mounted on the cams. In another embodiment, a double threaded tubular worm could be used in conjunction with a mating worm gear to impart faster ocillatory motion to the bearing unit.

Also provided as part of the invention are bearings 48 and 50 shown in Figs. 4A and 4B. Bearing 48 is pressed into a first retainer 52. The retainer 52 has threaded holes to facilitate dissemble of the retainer. An end plug 54 constrains retainer 52 in the axial direction by pushing against a shoulder 56 in the axial direction. Bearing 50 is pressed into the roller shell 44. The bearings 48, 50 provide bearing surface support for the bearing unit 28 of the roller assembly 24. These also serve to prevent excess "play" of the bearing unit 28 in the axial direction along the shaft 26. As the bearing unit 28 pushes against bearing 48 in the axial direction, the roller shell 44 moves to the left in the axial direction. As the bearing unit pushes against bearing 50 in the opposite axial direction, the roller shell 44 moves to the right in the axial direction.

The oscillating roller assembly heretofore described will find quick application as an dampening roller assembly for use with dampening systems for lithographic printing presses, for example. The oscillating roller assembly will be especially preferred over those currently utilized in the art due to lower replacement costs resulting from less wear. Those skilled in the art may find other applications for the novel design of the worm drive mechanism which utilizes the internally threaded worm, as well as for the oscillating roller assembly.

While modifications to the foregoing invention may oxccur to those skilled in the art, it is to be understoof that the invention is not intended to be limited to the particular embodiments decribed herein, but rather is intended to cover all modifications that are within the scope of the specification and accompanying claims.

Claims

1. A dampening system for lithographic printing presses, including a dampening roller provided by an oscillating roller assembly comprising:
   a. a shaft;
   b. a bearing unit mounted along said shaft;
   c. a worm gear having a plurality of teeth, said worm gear being disposed in a slotted space in said bearing unit and said shaft such that the rotational axis of said worm gear is sub-

stantially perpendicular to the longitudinal axis of said bearing unit and said shaft, said slotted space having first and second opposed ends within said shaft;

d. A pair of substantially coaxial eccentric cams integrally affixed to opposite surfaces of said worm gear, said cams alternately engaging said shaft at said opposite ends of said slotted space; and

e. a roller shell having at least one internal thread circumferentially mounted around said bearing unit such that said internal thread engages said teeth of said worm gear whereupon rotation of said roller shell causes said worm gear to rotate, thereby causing said cams to alternately engage said shaft at said opposed ends of said slotted space, thereby causing said bearing unit and said roller shell to oscillate along said shaft.

2. A system as claimed in Claim 1, further comprising a removable cover circumferentially disposed around said roller shell.

3. A system as claimed in Claim 1, wherein said worm gear has a right hand helix and said internal thread of said roller shell is left-handed.

4. A system as claimed in Claim 1, wherein said worm gear is supported within said shaft and said bearing unit by a dowel pin mounted through the axis of said worm gear, by a pair of needle bearings circumferentially disposed around said dowel pin, wherein said dowel pin is supported by a pair of drill bushings.

5. A system as claimed in Claim 1, wherein said roller shell has a double internal worm thread engaging said teeth of said worm gear.

6. A system as claimed in Claim 1, wherein a pair of crank arms translates the rotational motion of said worm gear into the oscillatory motion of said bearing unit.

7. A dampening roller in a lithographic dampening system which comprises a worm gear and a substantially hollow tubular worm having an outer surface and an inner surface, said inner surface having at least one internal worm thread engaging said worm gear.

8. A roller as claimed in Claim 7, wherein the axis of rotation of said tubular worm is substantially perpendicular to the axis of rotation of said worm gear.

9. A roller as claimed in Claim 7, wherein said inner surface of the worm has a double threaded worm engaging said worm gear.

10. A roller as claimed in Claim 7, wherein said internal thread is left-handed.

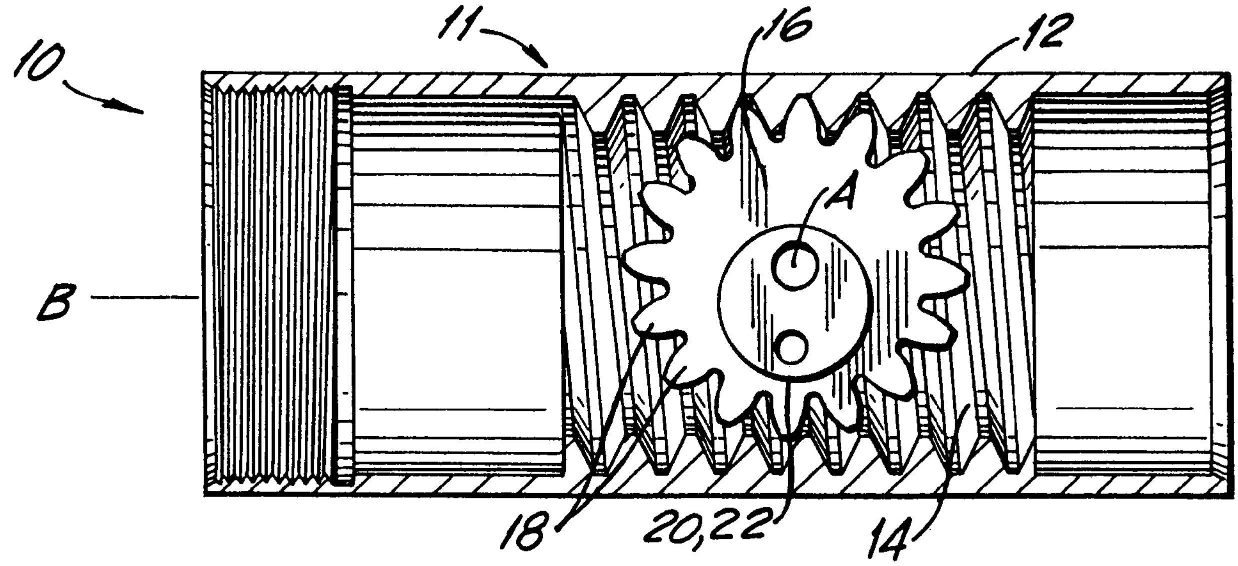
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Fig. 1

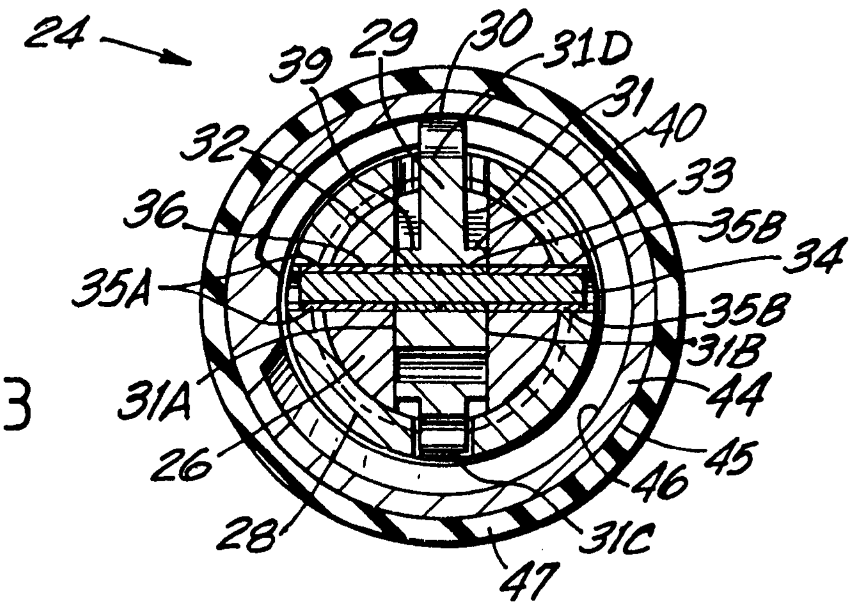
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Fig. 3

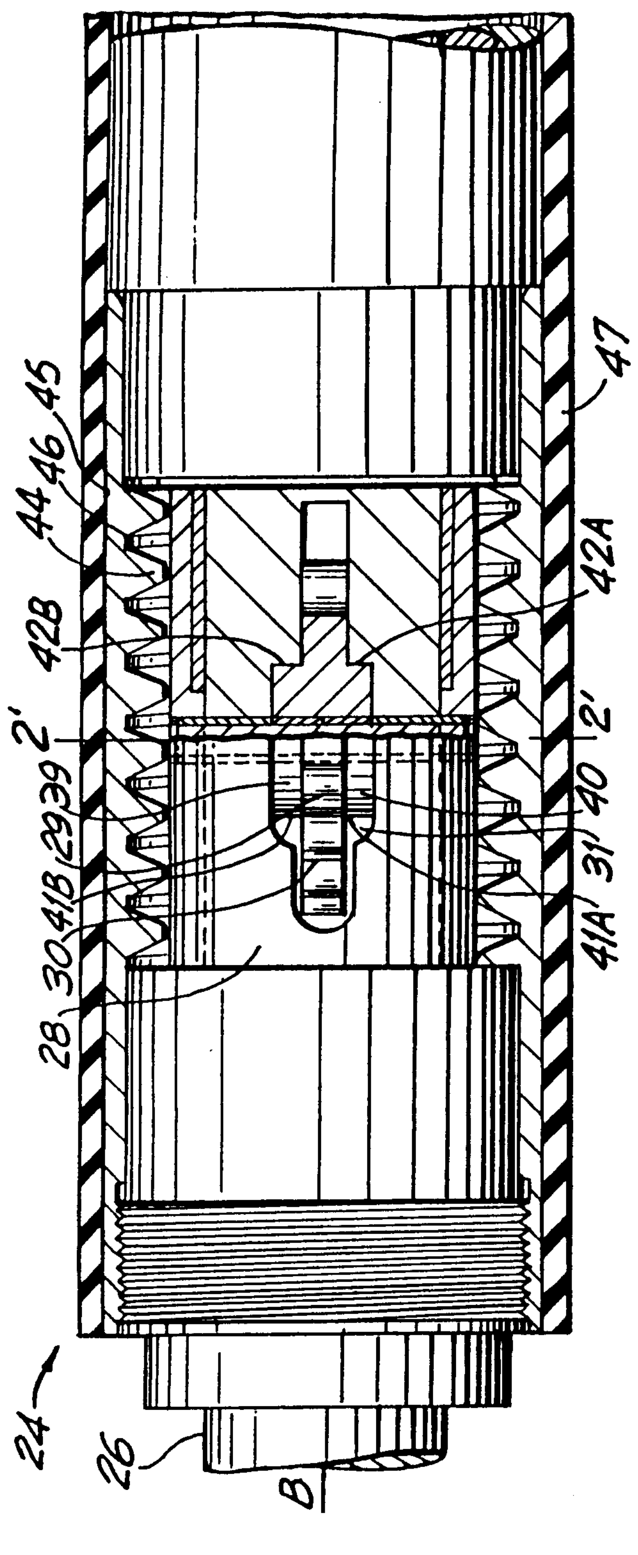

Fig. 2

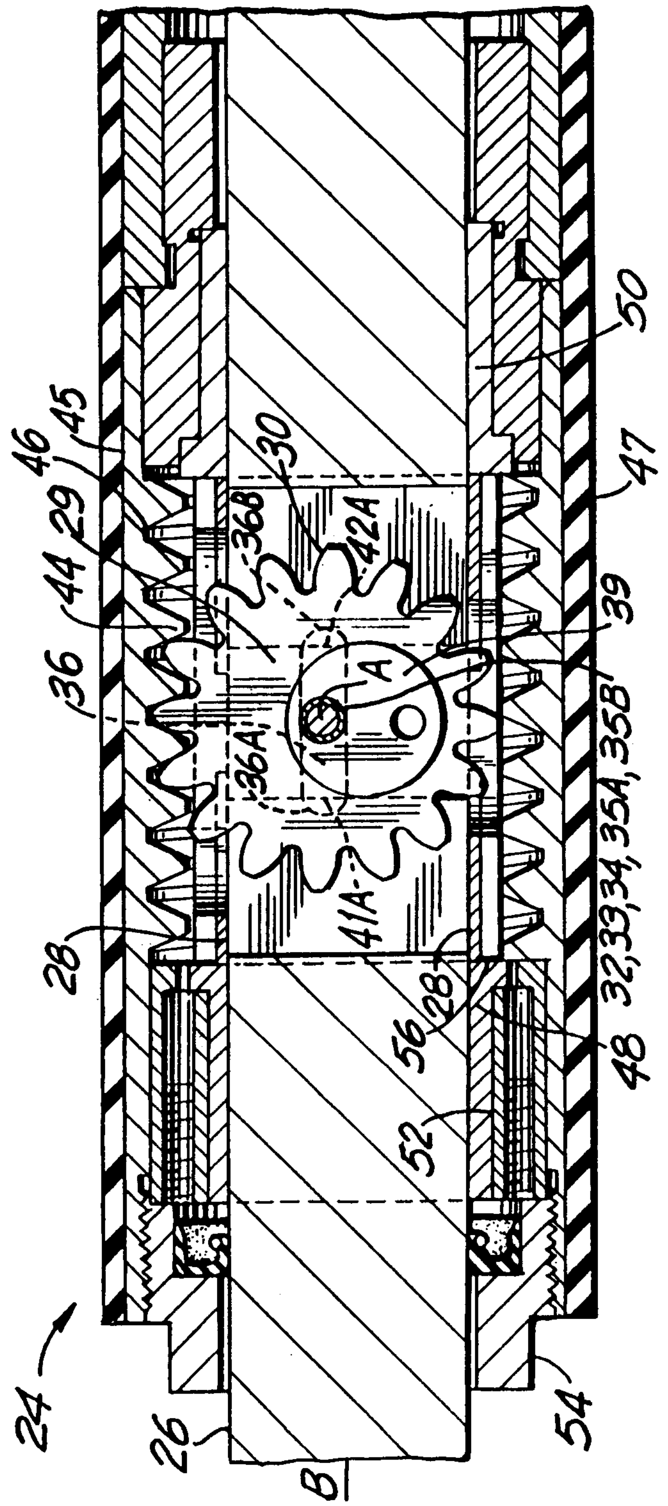
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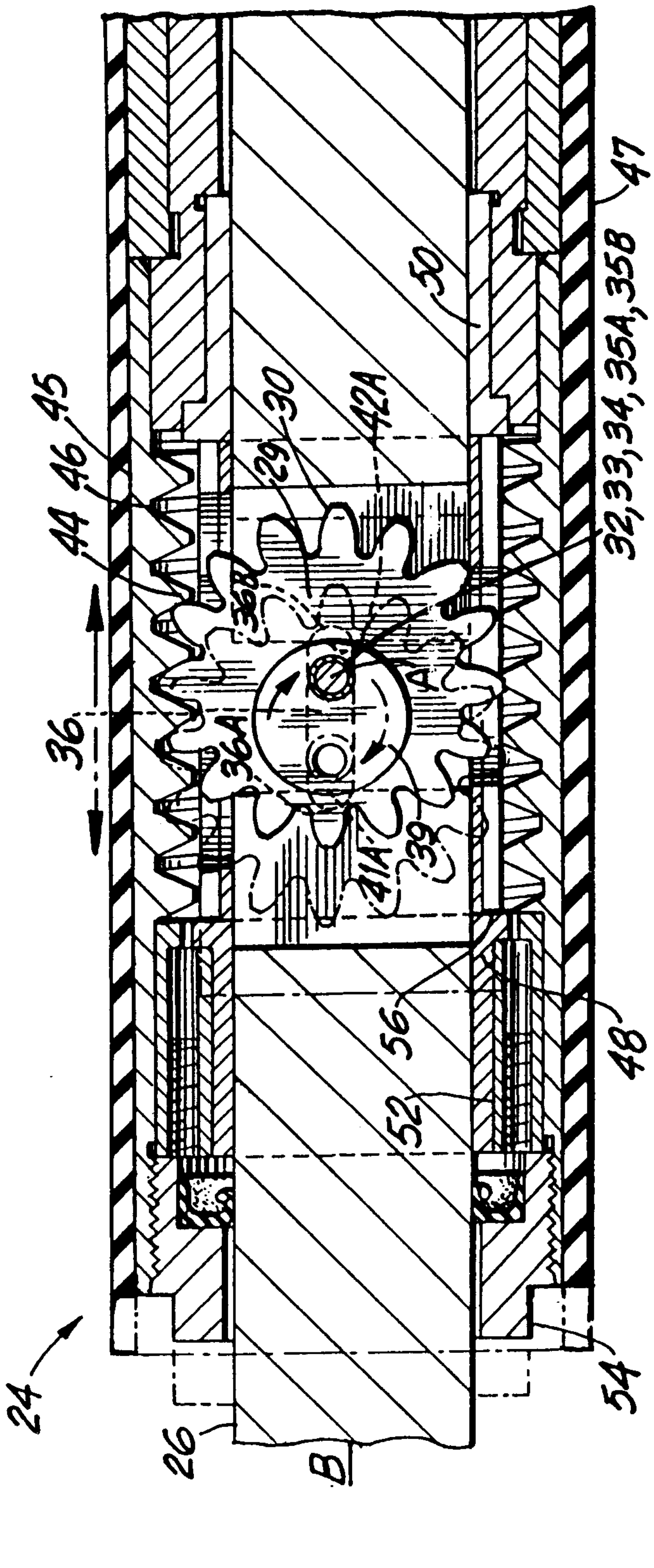
Fig. 4A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32,33,34,35A,35B
A

Fig. 4B

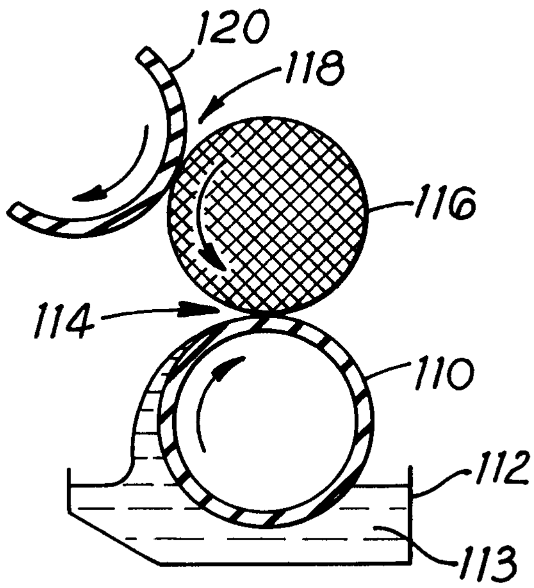

Fig. 5A

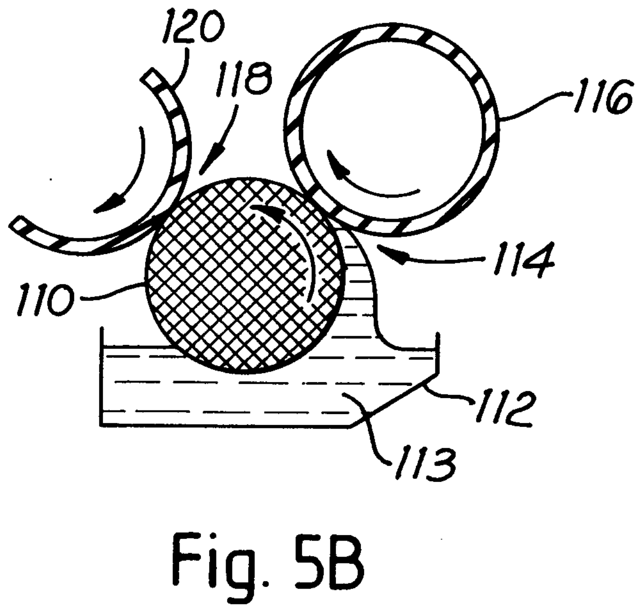

Fig. 5B

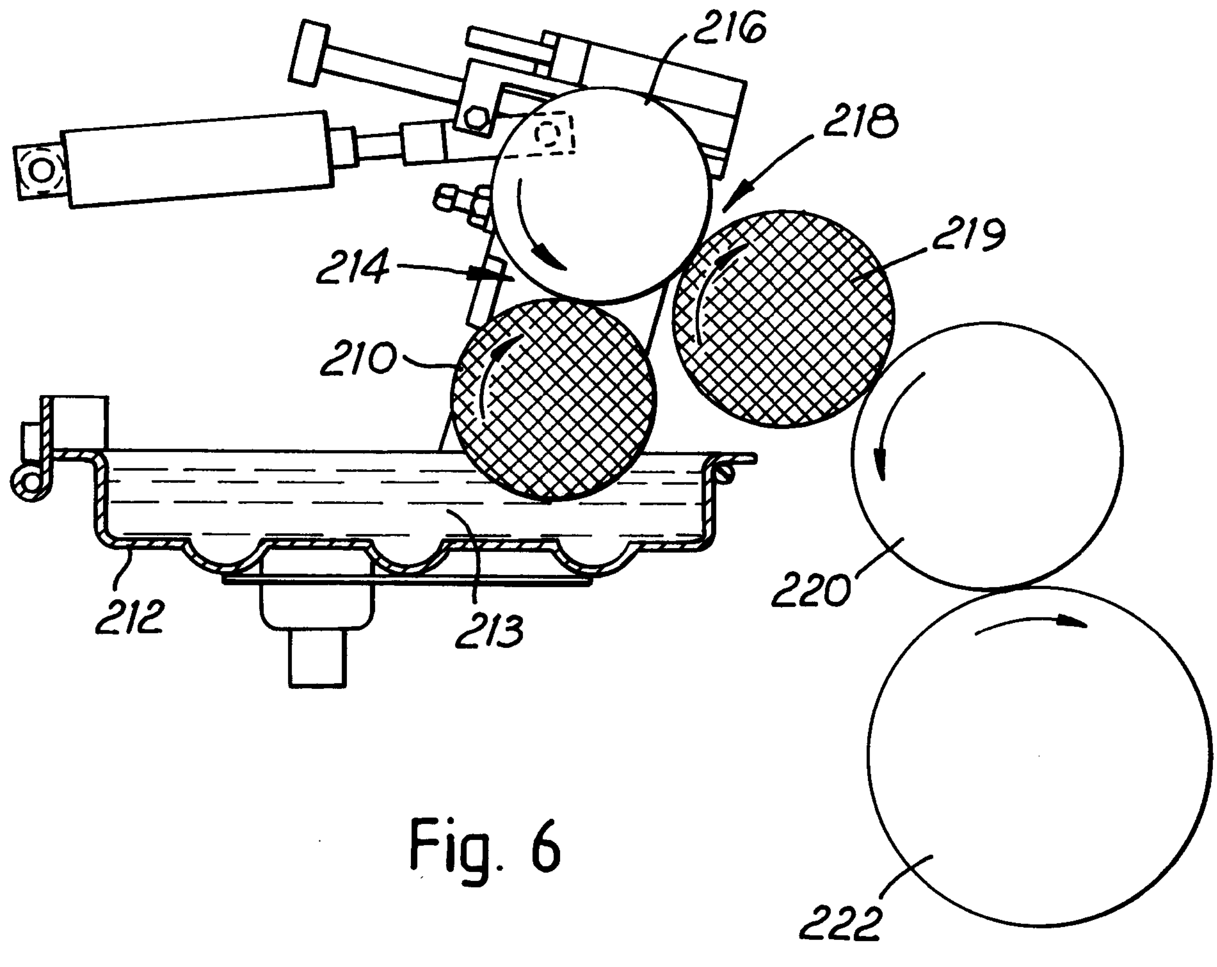

Fig. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 3644

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4 509 426 (HARDIN) * the whole document * -----	1	B41F31/14
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06 AUGUST 1992	MADSEN P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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