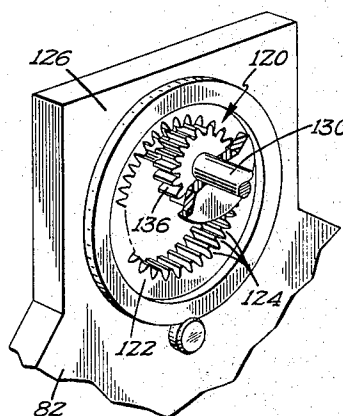
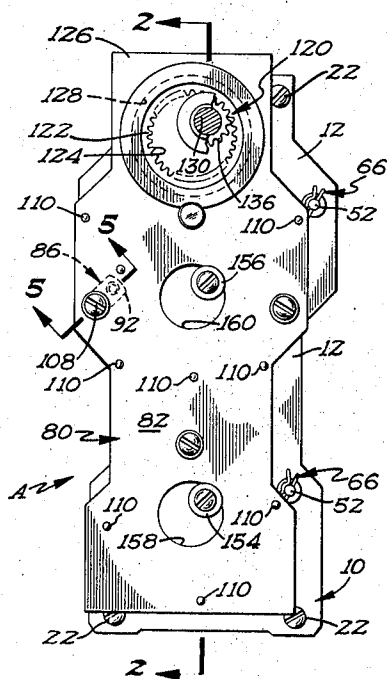
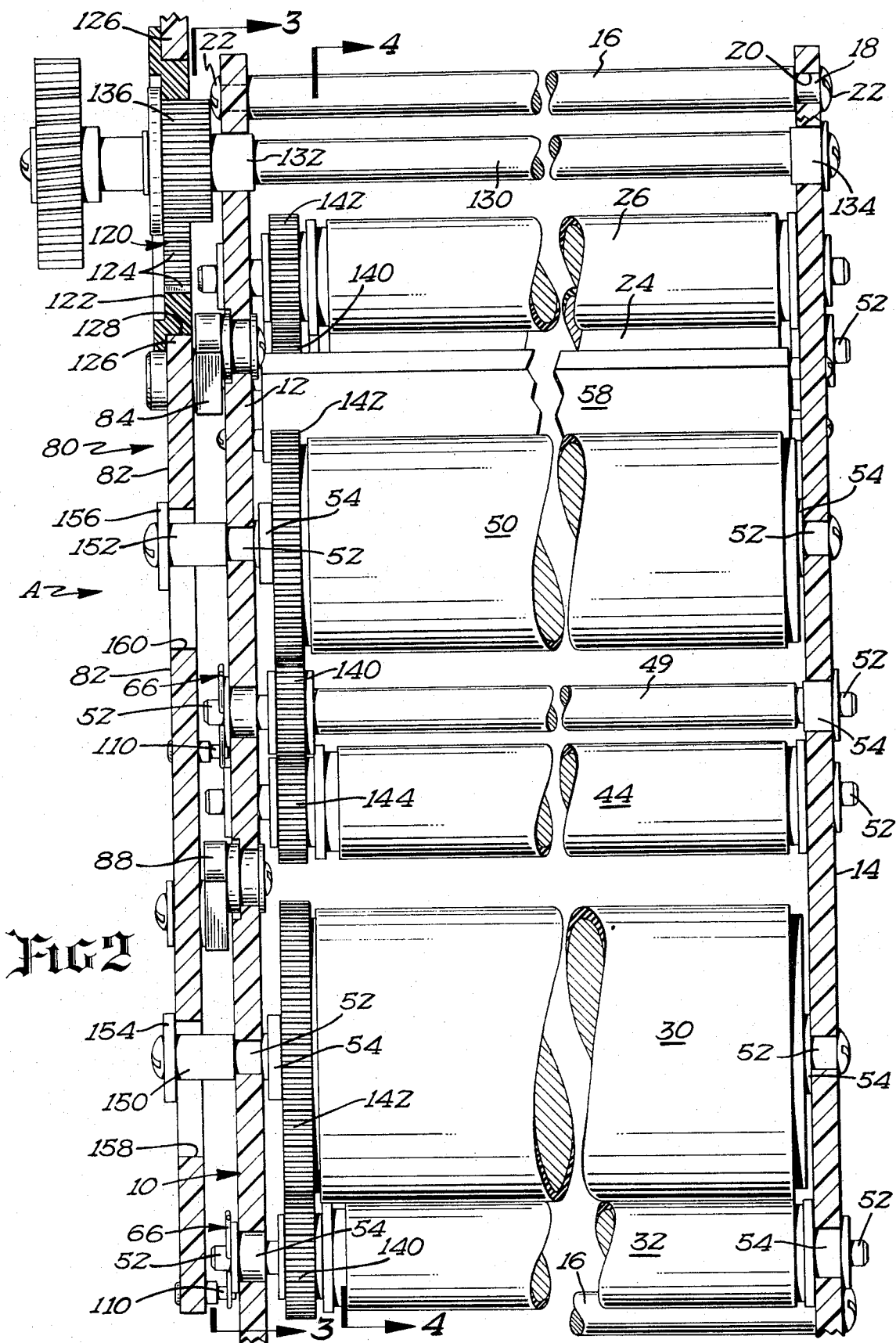


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- Driving means for transporting sheet material between a series of companion rollers rotatable in opposite directions and which are rotatably mounted in bearing means and rotated by cranks acting between certain of said rollers and a driving plate and gears between said driven rollers and the other rollers together with means for guiding the plate in circular and rectilinear movement, an internal ring gear fixed relative to said plate and a spur pinion whose pitch diameter is one half of that of the ring gear meshing with the ring gear and whose axis of rotation is fixed relative to the bearing means.

3 Claims, 6 Drawing Figures





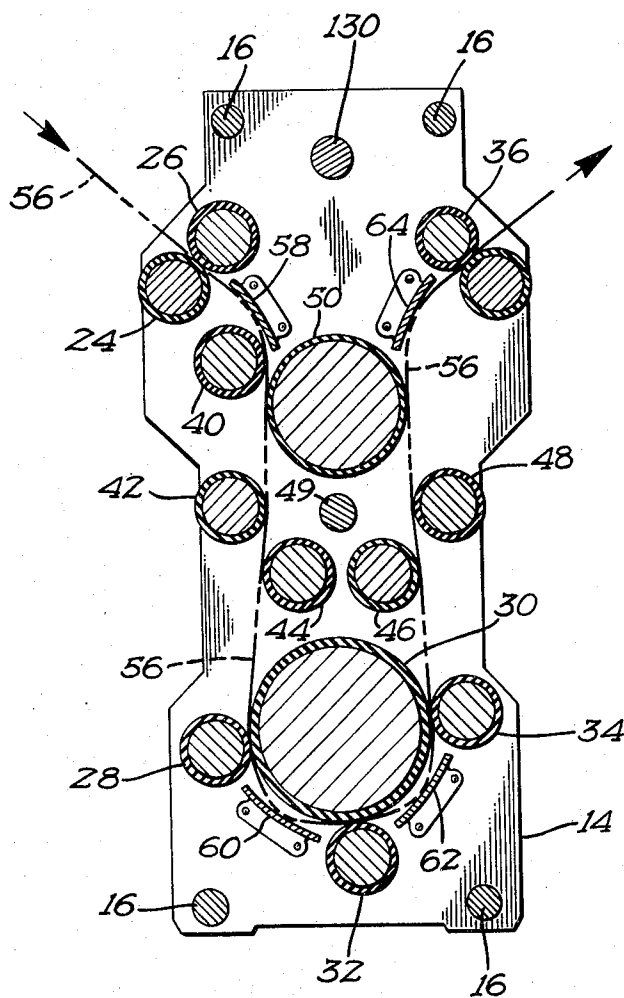


FIG 4

DEVICE FOR TRANSPORTING FILM THROUGH A SERIES OF ROLLERS

The invention relates to driving means for transporting film through a tank of developer, fix, solution, wash or the like by means of rollers including a drive plate driven in a rectilinear and rotary movement by an internal ring gear and a spur gear and not by a crank throw as in the prior art. With such a drive plate there are multiple points of drive and no gear trains thereby requiring fewer parts. With the drive plate herein described any roller can be made to drive or idle depending upon the particular demands of the type of film transported by the rollers.

RELATED ART

U.S. Pat. No. 3,520,461

U.S. Pat. No. 3,608,807

For the purpose of illustrating the invention one unit of a photographic developing apparatus embodying the invention has been shown in the drawings in which:

FIG. 1 is an end view of the unit

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1.

FIG. 3 is a vertical sectional view taken on line 3—3 of FIG. 2 and drawn to the same scale to which FIG. 1 is drawn.

FIG. 4 is a sectional view similar to FIG. 3 taken on line 4—4 of FIG. 2.

FIG. 5 is an enlarged fragmentary sectional view of the guide means of the invention taken on line 5—5 of FIG. 1.

FIG. 6 is an enlarged fragmentary view perspective of the drive means of the invention.

The supporting means of the invention which is indicated by the numeral 10 in the drawings consists of two stationary end plates 12 and 14 held together by the tie rods 16. These tie rods have reduced ends 18 which fit snugly into drilled holes 20 in the plates 12 and 14 and which are held in position by screws 22 screwed into the ends 18.

Extending between the end plates 12 and 14 are feed rollers 24, 26, 28, 30, 32, 34, 36, and 38, and guide rollers 40, 42, 44, 46, 50 and a free roller 49, particularly FIG. 4. All of the feed rollers have journals 52 which are journaled in bearings 54. The guide rollers are journaled in the plates 12 and 14. A sheet being fed through the unit A follows the path indicated by the dotted line 56, FIG. 4, the sheet being fed by the drive rolls 24 and 26 passing between a fixed first upper guide 58 and guide roller 40, deflected by rollers 50, 42, and 44 and in between feed rollers 30 and 28. The sheet is then guided by a fixed lower guide 60 between rollers 28 and 32, is fed by drive rollers 30 and 32 to another lower fixed guide 62 and from thereby said fixed guide 62 to the feed rollers 30 and 34. These rollers feed the sheet upwardly past and between guide rollers 48 and 50 where a second fixed upper guide 64 directs it between the feed rollers 36 and 38 where it is further directed out of the unit and to a following and adjacent unit or out of the developing apparatus.

The rollers 24, 40, 42, 49, 28, 32, 34, 48, and 38 are driven by individual cranks 66 all alike. These cranks are constructed from spring wire bent to form a loop 68 and two shanks 70 and 72 issuing therefrom. The shank 70 passes diametrically through the journal 52 and the shank 72 is bent to form a catch 74 which receives the

journal 52 and holds the crank in position on the end of the journal.

The cranks 66 are rotated by drive means 80 in the form of a plate 82 parallel with and spaced from the supporting plate 12. This plate 82 is supported by and guided for rotary and rectilinear movement by four identical guides 84, 86, 88 and 90 particularly FIG. 3 the guide 86 being shown in detail in FIG. 5. This guide 86 comprises an arm 92 constructed of plastic material and drilled at its ends to form two spaced transverse holes 94 and 96. In these holes are driven nuts 98 and 100. In the supporting plate 12 of supporting means 10 is mounted a ball bearing 102. A screw 104 passes through this ball bearing and is screwed into the nut 98. In the drive plate 82 is also mounted a ball bearing 106. A bolt 108 extends through this ball bearing and is screwed into the nut 100. This construction provides four cranks arranged so that the arms of the same always remain parallel during movement of plate 82 and so that every point of the plate makes a complete circle of the same diameter as the plate is driven. The plate 82 is actuated in a rectilinear and rotary movement. Extending inwardly from the plate 82 are crank pins 110 which enter the loops 68 of the crank 66 and transmit to the driven roller simultaneous rotary motion.

The motion producing means for actuating the drive means 80 is best shown in FIG. 6 and is designated by the reference number 120. This construction comprises a spur ring gear 122 which has teeth 124 on the inner face thereof and which is mounted on the upper portion 126 of the plate 82 and is received in a circular opening 128 in said plate. Extending through the gear 120 is a drive shaft 130 which is journaled in bearings 132 and 134 carried by the supporting plates 12 and 14. This shaft carries a spur pinion 136 which meshes with the internal spur ring gear 122 mounted on plate 82. The pinion 136 has half the pitch diameter of the ring gear 120 so that as shaft 130 rotates the plate 82 moves in a manner such that each pin 110 travels in a circle of the same diameter as the diameter of the circle traveled by the loops 68 of the cranks 66. These pins drive rollers 24, 40, 42, 28, 32, 34, 48, 49 and 38. The rollers 26 and 36 are driven from rollers 24 and 38 by meshing spur gears 140 and 142 mounted on the journals of said rollers. The rollers 50, 44 and 46 are driven from the roller 49 by means of spur gears 140, 142, 144 and 146.

The plate 82 is guided in its rectilinear and rotary movement by means of the pins 150 and 152 secured to the end plate 12, the pins formed with the flat heads 154 and 156 respectively. The drive plate 82 is formed with the circular openings 158 and 160 of a diameter so that the heads of the pins 150 and 152 are always in contact with the outer surface of the plate 82.

The advantages of the invention are manifest. By using ball bearings in the drive means, coordinated movement of the crank arms is procured thus preventing binding by irregular movement of the parts. Further, use of the internal drive gear to move the drive plate produces the same drive movement at all positions of the drive pinion with respect to the ring gear thus preventing a dead position between the parts restraining movement therebetween

I claim:

1. In a device for transporting film of the type having supporting means, a plurality of rotary members bearing means on said supporting means for supporting said

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rotary members for rotation, a drive plate having pins mounted thereon, individual cranks acting between certain of said pins and said rotary members, guides acting between said bearing means and said drive plate and guiding said drive plate for rotary and rectilinear movement, the combination of

- a. motion producing means for actuating said drive plate comprising:
- b. a circular drive member coaxing with
- c. a circular driven member
- d. said drive member having the axis thereof fixed relative to said supporting means and

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e. said circular driven member being mounted in and fixed relative to said drive plate.

2. Motion producing means according to claim 1 in which:

- a. the circular drive member is a spur pinion and
- b. the circular driven member is a spur gear.

3. Motion producing means according to claim 1 in which:

- a. the circular driven member is a ring gear, and
- b. the circular drive member is a spur pinion gear operating within the confines of the ring gear.

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