Aug. 9, 1960 L. S. TYMA, JR., ET AL 2,948,215

CONSTANT BACKLASH GEARING FOR A PRINTING COUPLE

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Fig. 1

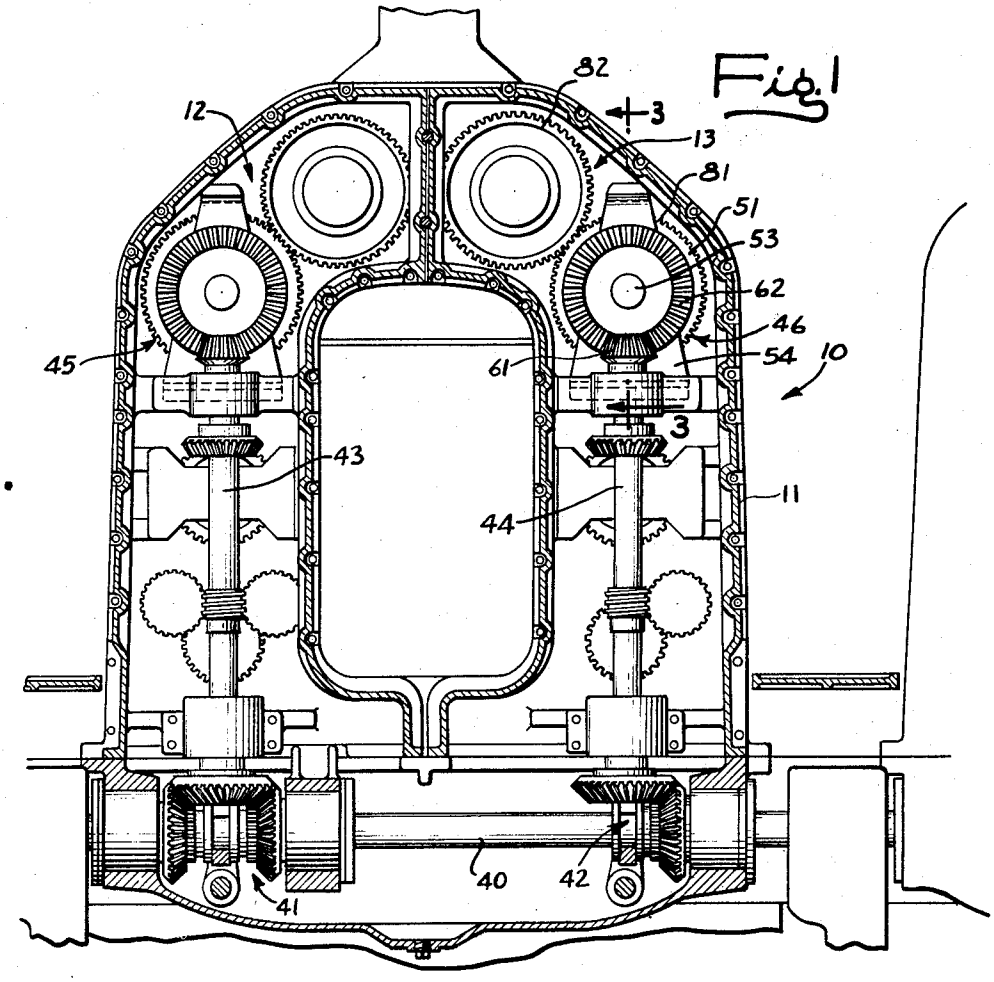
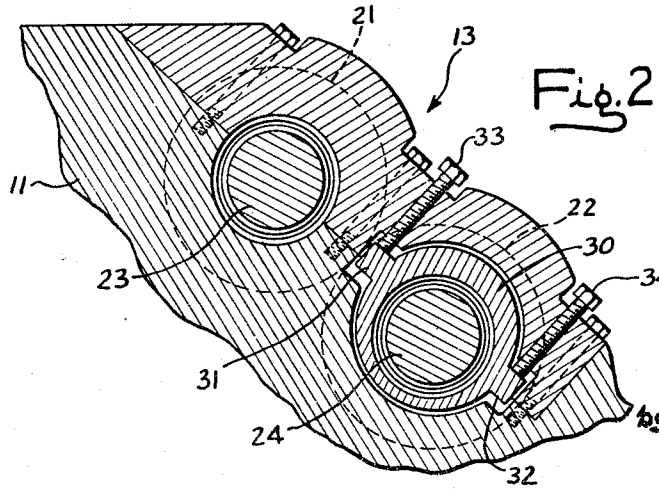


Fig. 2



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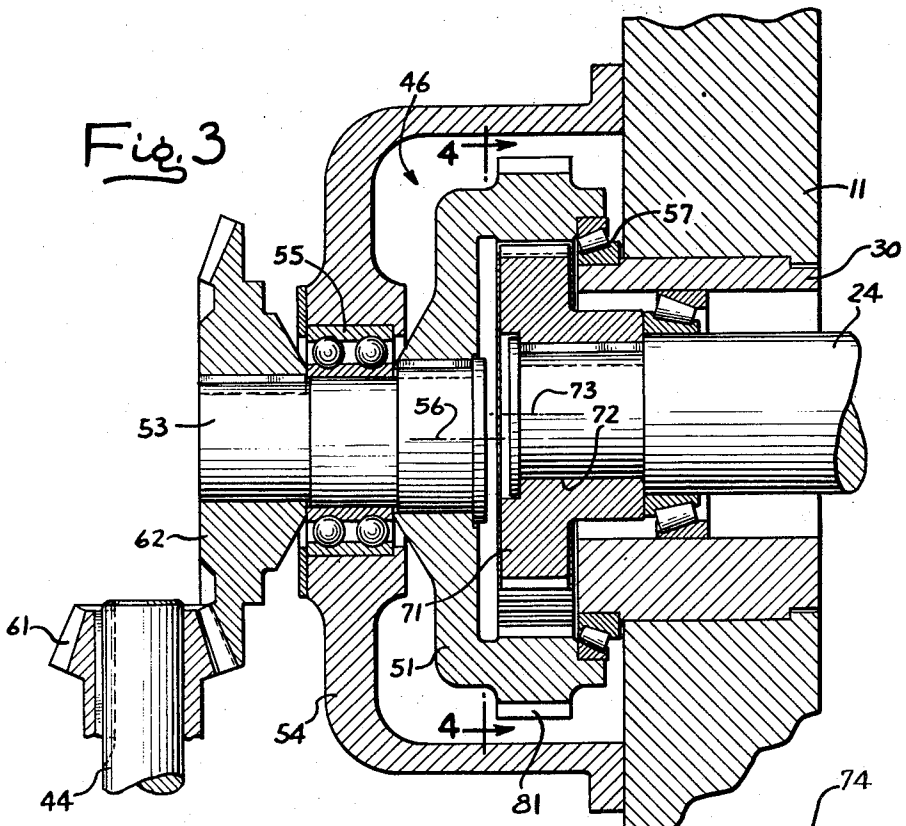
by: Carlson, Pitzner, Hubbard + Wolff ATTYS.

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Fig. 3



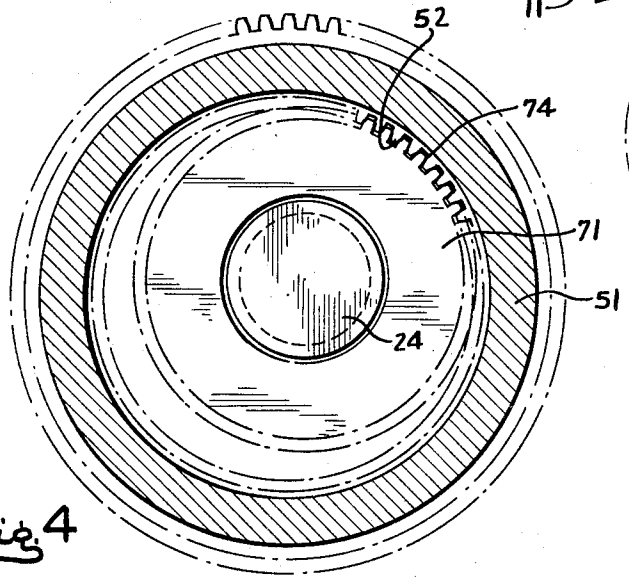


Fig. 4

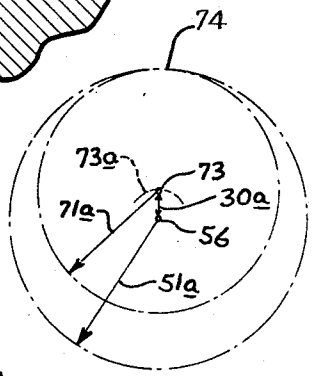


Fig. 5

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CONSTANT BACKLASH GEARING FOR A PRINTING COUPLE

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8 Claims. (Cl. 101—216)

The present invention relates to improvements in rotary printing presses and concerns more particularly a novel gear drive for the plate and impression cylinders of a printing couple.

Rotary presses are commonly constructed to provide relative movement, i.e., an impression adjustment, between the plate and impression cylinders of each printing couple. Such relative movement between the cylinders is necessary in order to compensate for the slightly varying thicknesses of the cast plates which are mounted on the plate cylinder, and to adjust for the "beating down" of the impression cylinder blanket after continued operation.

The usual way in which impression adjustment is secured is to mount the bearings for one cylinder of each couple in eccentric sleeves which are rotatably supported by the side frames of the press. By rotating the eccentric bearing supports, relative cylinder adjustment is achieved.

However, since the plate and impression cylinders are normally directly geared for simultaneous, but opposite, rotation, impression adjustment presents a troublesome problem which results from variable gear backlash. It will be understood that gears have fixed pitch diameters, and that optimum performance from a meshing set of gears can be achieved at only one relative spacing of the gears. When this optimum spacing is varied, the result is "noisy" gearing and increasing backlash. Heretofore, impression adjustment of a rotary printing couple has inherently altered the meshing engagement of the printing couple gearing and has meant that the cylinder gears are noisy and subject to varying amounts of backlash.

While the "noise" of the gearing is annoying and indicative of excessive wear, the problem of variable backlash is even more serious, directly affecting the quality of the printing, particularly when color printing. Each time the speed of the press is altered, the varying amounts of backlash in the gearing that drives the several printing couples causes relative shifting between the couples, and the resulting color printing moves out of register. Since the speed of a press may be changed fairly frequently, as when slowing the press for changing a paper roll or stopping the press to substitute plates for later newspaper editions, a significant percentage of the total press run is subject to out-of-register color work as a result of gear backlash.

Accordingly, it is the general aim of the present invention to provide constant backlash gearing for a rotary printing couple which permits simple eccentric impression adjustment of one of the cylinders in the printing couple without shifting the meshing engagement of the gears connecting the couple. In this way, the printing couple gears can be properly meshed for optimum performance resulting in minimum noise and backlash, and

this setting will remain constant as the cylinders are relatively adjusted.

It is also an object of the invention to provide constant backlash gearing as described above which is readily adaptable for use in standard rotary presses.

Moreover, it is an object to provide constant backlash gearing of the above type which is simple and inexpensive to manufacture.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

Figure 1 is an end view of a single press unit with its cover plate removed, showing the gearing embodying the present invention for the printing couples;

Fig. 2 is a fragmentary section showing the eccentric impression adjustment of one of the printing couples of the press unit shown in Fig. 1;

Fig. 3 is a section taken along the line 3—3 of Fig. 1;

Fig. 4 is a section taken along the line 4—4 of Fig. 3; and

Fig. 5 is a diagrammatic view of the pitch circles of the gears shown in Fig. 4.

While the invention will be described in connection with a preferred embodiment, it will be understood that we do not intend to limit the invention to that embodiment. On the contrary, we intend to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention and defined by the appended claims.

Turning first to Figure 1, there is shown a press unit 10 which includes a frame 11 that supports a pair of printing couples 12 and 13. The couple 13 which is identical but of opposite hand to the couple 12, is made up of an impression cylinder 21 and a plate cylinder 22 carried on shafts 23, 24, respectively (see Fig. 2).

In order to provide for impression adjustment between the cylinders 21, 22, the shaft of one of the cylinders, in the present instance the shaft 24 of the plate cylinder 22, is journaled eccentrically in a sleeve 30 that is rotatably supported in the press frame 11. The sleeve 30 is formed with a pair of opposed lugs 31, 32, and adjusting screws 33, 34, which are threaded in the frame 11, bear against the lugs 31, 32, respectively. It can be seen that by threadably adjusting the screws 33, 34, the sleeve 30 can be rotated so as to shift the cylinder 22 toward and away from the cylinder 21.

For the purpose of driving the press unit 10, a main power shaft 40 is journaled beneath the unit and is driven by a suitable source of power, not shown. The power shaft 40 is coupled through sets of bevel gears 41, 42 to vertically journaled couple drive shafts 43, 44, respectively. The vertical shaft 43 drives the printing couple 12 through constant backlash gearing 45, and the vertical shaft 44 drives the printing couple 13 through similar constant backlash gearing 46. Since the gearing 45, 46 for the couples 12, 13 is identical, only the gearing 46 will be described in detail as a matter of convenience.

In accordance with the present invention, the gearing 46 which rotatably couples the two shafts 23, 24 of the printing couple 13 includes meshing internal and external gears, one secured to the adjustably supported shaft and the other journaled on an axis coinciding with the true axis of the eccentric support for the adjustable shaft, the gears having pitch radii differing from one another by the amount of eccentricity of the eccentric support.

In the present embodiment a cup-shaped ring gear 51

having internal teeth 52 is carried on a shaft 53 that is journaled in a bracket 54 by a bearing 55. The bracket 54 is secured to the frame 11 so that the axis 56 of the gear 51 coincides with the true axis of the eccentric sleeve 30. Additional support is given to the gear 51 by interposing a bearing 57 between the gear and the outer periphery of the sleeve 30.

Meshing with the internal teeth 52 of the ring gear 51 are the external teeth of a gear 71 that is fixed to a reduced portion 72 at the end of the adjustable cylinder shaft 24 so that the axis 73 of this gear coincides with the axis of the shaft 24. The pitch radius 71*a* of the gear 71 differs from the pitch radius 51*a* of the gear 51 by an amount equal to the eccentricity 30*a* of the sleeve 30 (see Fig. 5).

For coupling the ring gear 51 with the shaft 23 of the impression cylinder 21, the gear 51 is formed with external gear teeth 81 which are in meshing engagement with a gear 82 secured to the end of the shaft 23 (see Figs. 1 and 2).

In order to drive the gearing 46 from the vertical shaft 44, the illustrated embodiment includes a bevel drive gear 62 fixed to the shaft 53 and which is in meshing engagement with a bevel pinion 61 on the shaft 44. The main power shaft 40 is thus in direct driving engagement with the ring gear 51.

The operation of the constant backlash gearing 46 will be apparent to one skilled in the art from the above description. However, to briefly review the novel driving train, it may be noted that the main power shaft 40 drives the vertical drive shaft 44 through the beveled gearing 42. The shaft 44 is coupled through gears 61, 62 to the shaft 53 so that rotation of the shaft 44 drives the ring gear 51 which is fixed to the drive shaft.

The gear 51 rotates the plate cylinder 22 through its internal teeth 52 that are in meshing engagement with the gear 71 secured to the shaft 24 of the plate cylinder. The gear 51 also drives the impression cylinder 21 through the engagement of its external teeth 81 with the gear 82 secured to the impression cylinder.

When the plate cylinder 22 is shifted by slightly rotating the eccentric sleeve 30 to effect an impression adjustment of the printing couple 13, it will be seen that the gear 71 is carried with the plate cylinder shaft 24 through a slight arc 73*a* (see Fig. 5). Although this will shift the point of engagement 74 between the gear 71 and the internal teeth 52, it will not vary the spacing between the axis 73 of the gear 71 and the pitch circle of the internal teeth 52. In other words, even though the gear 71 may be swung through the arc 73*a* by rotating the sleeve 30. Meshing engagement of the internal gear teeth 52 and the external teeth on gear 71 will always occur on the pitch circles of the two gears.

It can therefore be appreciated that each set of interengaging gear teeth driving the printing couple 13 can be formed and fitted for minimum noise and backlash. Once established, the meshing engagement between the various gears will not be varied even though the plate cylinder 22 may be shifted for impression adjustment by rotating the eccentric sleeve 30.

The constant backlash gearing described above is basically simple, is economical to manufacture, and can be readily adapted for use with any standard rotary press.

We claim as our invention:

1. In a rotary printing press having a printing couple with one cylinder of the couple supported by an eccentric sleeve for impression adjustment of the couple, gearing for driving the couple comprising, in combination, a driven input shaft journaled on an axis which coincides with the true axis of said sleeve, and a pair of meshing gears coupling said shaft and the eccentrically mounted cylinder, one of said gears being an internal gear and the other an external gear whose pitch radii differ from one another by the amount of eccentricity of said sleeve.

2. In a rotary printing press having a printing couple with one cylinder of the couple supported by an eccentric sleeve for impression adjustment of the couple, gearing for driving the couple comprising, in combination, a first gear having internal teeth and being journaled on an axis coinciding with the axis of said eccentric sleeve, means coupling for rotation said gear and the cylinder of the printing couple that is not supported by said sleeve, a second gear having external teeth and being secured to the cylinder that is supported by said sleeve, said gear teeth being in meshing engagement, and means for driving said first gear.

3. In a rotary printing press having a printing couple with one cylinder of the couple being journaled on a fixed axis and the other cylinder being supported by an eccentric sleeve for impression adjustment of the couple, gearing for driving the couple comprising, in combination, a cup-shaped gear having both internal and external teeth journaled on a fixed axis coinciding with the axis of said eccentric sleeve, a gear on the fixed axis cylinder of the printing couple in meshing engagement with said external teeth, a gear secured to the cylinder that is supported by said sleeve in meshing engagement with said internal teeth, and means for driving said cup-shaped gear.

4. In combination with a printing couple having a first cylinder journaled on a fixed axis and a second cylinder journaled on an adjustable mounting adapted to swing the second cylinder through an arc of fixed radius toward and away from said first cylinder, constant backlash gearing for rotatably coupling said cylinders, comprising, internal and external gears being in mesh and having their pitch radii differing by an amount equal to said fixed radius, one of said gears being carried by said second cylinder and the other of said gears being journaled on an axis coinciding with the axis of said cylinder-swinging mounting.

5. In a rotary printing press, the combination comprising, a printing couple including first and second cylinders, said first cylinder being journaled on a fixed axis, said second cylinder being journaled eccentrically in a rotatable sleeve, means for adjustably rotating said sleeve so as to vary the relative spacing of said cylinders, an internally toothed gear journaled on a fixed axis coinciding with the axis of said sleeve, said gear and said first cylinder being in driving engagement, a gear meshing with said internal teeth and being secured to said second cylinder, and means for driving said internally toothed gear.

6. In a rotary printing press, the combination comprising, a printing couple including first and second cylinders, said first cylinder being journaled on a fixed axis, said second cylinder being journaled eccentrically in a sleeve, means for adjustably rotating said sleeve so as to vary the relative spacing of said cylinders, a member having both internal and external teeth circularly disposed, said member being journaled on axis coinciding with the axis of rotation of said sleeve, a gear on said first cylinder in driving engagement with said external teeth, a gear meshing with said internal teeth and being secured to said second cylinder, and means for driving said member.

7. A drive for a printing couple on a rotary printing press consisting of first cylinder mounted for rotation on a fixed center and a second cylinder eccentrically mounted in adjusting relationship with said first cylinder, comprising a driven gear having internal and external teeth journaled on the center of the eccentric mounting, a first gear mounted on the shaft of said first cylinder and in mesh with the external teeth of said driven gear for rotating said first cylinder, and a second gear mounted on the shaft of the second cylinder in mesh with the internal teeth of said driven gear for rotating said second cylinder.

8. A drive for a pair of adjacent shafts rotating in synchronism and consisting of a first shaft rotatably mounted on a fixed center and a second shaft rotatably

mounted on an eccentrically movable center, comprising a driven gear having external and internal teeth mounted on a fixed axis coinciding with the center of the eccentric mounting, a first gear mounted on said first shaft in driving connection with the external teeth of said driven gear for rotating said first shaft, and a second gear mounted on said second shaft in driving connection with the internal teeth for rotating said second shaft.

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