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C. W. HARROLD

COMPENSATING GEAR MECHANISM

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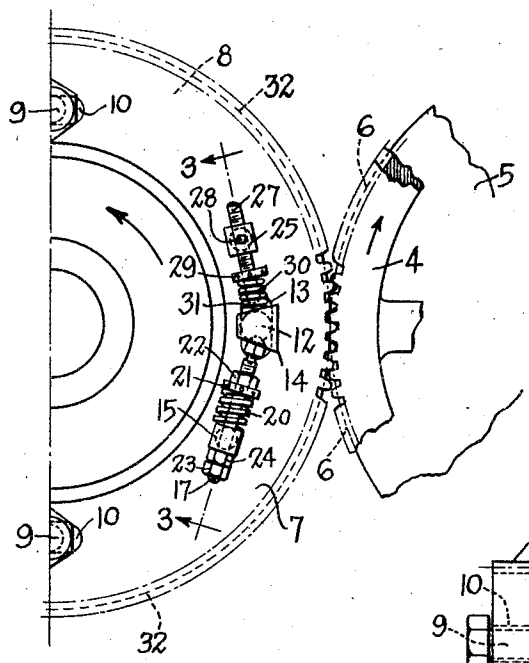


Fig. 1.

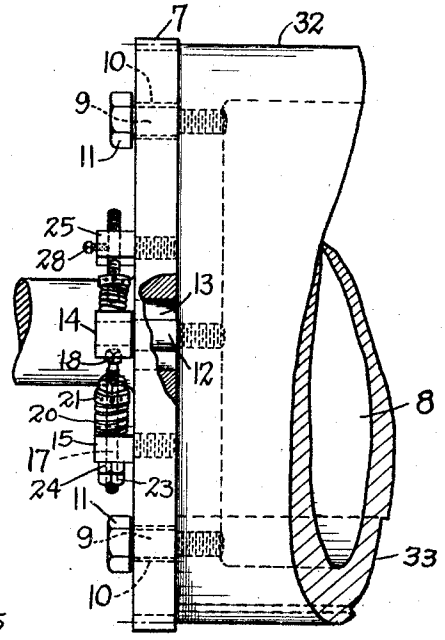
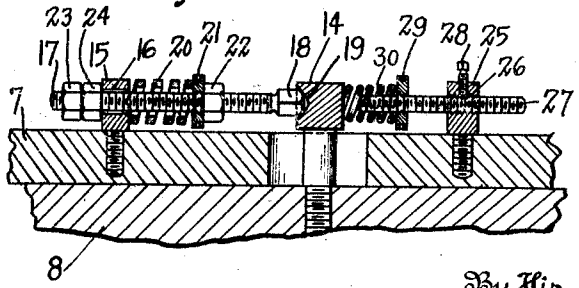


Fig. 2.

Fig. 3.



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COMPENSATING-GEAR MECHANISM.

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My invention relates broadly to compensating mechanisms to be associated with the connecting gears of a pair of rotating members or elements in which the driven member may be allowed to rotate independently of its gear in at least one direction when such member is being actuated by rolling contact with the driving member.

Such compensating gear mechanism involving my invention may be utilized in many and widely different kinds of machinery in which such coacting rotary members are to be operated with requisite compensation or flexibility between the coacting gears carried by such members particularly when such coacting members are driven through frictional contact or otherwise than through such engaging gears.

A preferred use of my invention is embodied in rotary printing machinery in which two cylinders are arranged in mutually parallel relationship with one cylinder having a drive gear in mesh with a compensating gear carried by the driven cylinder which is allowed to travel to a limited extent in either direction relatively to the rotation of its gear during different portions of their cycle.

The aim of my invention is, among other things, to provide a compensating gear mechanism of this character which is certain and precise in action, simple in construction, and by which the various objects hereinbefore named and others can be effectively accomplished without in any way affecting the accuracy of the predetermined relation of the two cylinders, irrespective of their speed of rotation. To this end my improved gear mechanism as applied to printing-presses provides that at a certain point in the driven cylinder cycle, such cylinder and its gear are brought into predetermined relation or register; for example, at the beginning of the printing surface contact in printing a sheet. During such printing period when the printing cylinders are in rolling contact, the driven cylinder is inclined to run ahead of its gear, but is immediately brought back to the initial and predetermined relation with the other cylinder by my improved compensating gear mechanism as soon as such cylinder rolling contact ceases.

A further feature of novelty in my improvement, more particularly in connection with printing-presses, resides in preventing a pair of coacting cylinders from slipping on each other when rolling together, which slipping would cause injurious wear on the printing surfaces and marks or streaks in the printing. Such slipping is always likely to occur when the cylinders are rigidly geared together. This improved mechanism also possesses other advantageous features of novelty in the printing art, and also when applied to other forms of machinery in which compensating gear mechanisms of this character are required or highly desirable to ensure effective operation.

In the accompanying drawings, Fig. 1 is a partial end elevation of the coacting gears and their respective cylinders showing the use of my improvement in one of the several forms of embodiment in connection with a rotary printing-press;

Fig. 2 is a partial side view of one of the cylinders equipped with the compensating gear mechanism; and

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 2 looking in the direction of the arrows.

Similar numerals refer to similar parts throughout the several figures.

Referring to the drawings, the gear 4 is rigidly secured to the driving cylinder 5 in which the peripheral surface or bearer line is indicated by the dotted line 6 in Fig. 1, such gear being rotated in the direction of the arrow shown in Fig. 1. The gear 4 engages and drives the gear 7 carried by the driven cylinder 8. The gear 7 is secured to the cylinder 8 by cap-screws 9 passing through elongated slots 10, the screws being threaded into the end of the cylinder 8 as shown in Fig. 2. The slots 10 and the heads 11 of the cap-screws 9 provide a suitable clearance (Fig. 2) with the gear 7 to permit the latter to have a limited rotation independent of the cylinder 8.

Also affixed to the cylinder 8 is the central stud 12 projecting through the elliptical slot 13 formed in the gear 7. The head 14 of the stud 12 projects slightly above the outer surface of the gear 7 as shown in Fig. 3 to provide the necessary clearance. Threaded to the gear 7 is the bracket 15 having the smoothed bore 16 through which passes the threaded bar 17, having its tip 18 engaging the socket 19 formed in one side of the head 14 thereby providing a fixed registering stop

as shown in Fig. 3. Coiled about the bar 17 is the heavy compression driving spring 20, one end of which bears against the inner side of the bracket 15 while the other end bears against the adjusting collar 21 threaded on the bar 17, the collar 21 being held in position by the locking-nut 22. Locking nuts 23 and 24 are threaded on the outer end of the bar 17 outside the bracket 15 as shown.

Also threaded to the gear 7 opposite the central stud 12 is the bracket 25 having the threaded bore 26 in which is threaded the screw-bar 27 held in any predetermined position in the bracket 25 by set-screw 28. Inside the bracket 25 the adjusting collar 29 is threaded on the bar 27 and coiled about the inner end of the bar 27 is the light reacting spring 30, one end bearing against the collar 29 and the other end bearing against the inclined face 31 formed on the head 14 opposite the socket 19. The peripheral surface 32 or bearer line of the cylinder 8 (Fig. 2), is also indicated by the dotted line 32—32 in Fig. 1.

The operation of my compensating gear mechanism as shown when embodied in a rotary printing-press in printing sheets is substantially as follows: When the gear 4 is driving the cylinder 8 through the gear 7, driving spring 20 and bar 17 bearing on the stud 12, such heavy spring 20 is designed to take care of any jars or shocks greater than the normal driving load, while permitting the cylinders 5 and 8 to roll equally together. Under certain conditions the spring 20 may be pressed down until entirely compressed and so form a solid or rigid drive for the stud 12 fastened to the cylinder 8. However, I have found that the use of such heavy coil spring 20 so adjusted and set that it will normally drive the cylinder 8 without further compression is desirable as an additional safeguard against abnormal jars or shocks which might disturb the rolling contact of the cylinder bearers 6 and 32.

The chief function of my compensating mechanism is performed by the reatcing spring 30 which is lighter than spring 20 and is so adjusted by the collar 29 that its compression is less than the frictional power of the two cylinders 5 and 8 through their bearers 6 and 32 respectively when rolling together. During the printing portion of the revolution, the cylinder 8 has a tendency to be driven from its coacting cylinder 5 through frictional contact of the peripheral surfaces 6 and 32 extending longitudinally throughout the surfaces of the cylinders. While so rolling together, any inequality of cylinder diameter or irregularity of the meshing teeth in the gears 4 and 7 may cause the cylinder 8 to run ahead of the gear 7, and immediately the spring 30 will yield so as to allow a true rolling contact to be maintained between the cylinder surfaces 6 and 32 until the printing of the sheet is completed. In the balance of the revolving cycle, the cylinder surface 32 may be depressed or cut away for a short segment 33 as shown in Fig. 2 with respect to the cylinder 5 so that this rolling contact does not exist; during this period of travel the force of the reacting spring 30 brings the cylinder 8 back with the tip 18 of the bar 17 in full contact with the socket 19 formed in the stud 12, or back to its normal predetermined position in readiness to begin the next printing revolution with the rolling contact drive between the two cylinder surfaces 6 and 32.

It will therefore be observed that the spring 30 automatically functions to retard the cylinder 8, or hold the stud 12 against the tip 18 of the bar 17, at all times to secure proper relation of the cylinders, except when the force of such spring 30 may be overpowered by the driving effect produced by the frictional engagement of the cylinder bearers 6 and 32; and further that such spring 30 immediately brings the cylinder 8 back against a fixed stop at proper relation with the cylinder 5 ready for the beginning of the printing surface contact, as soon as the overpowering frictional drive from rolling contact of the coacting cylinders 5 and 8 ceases at the end of the previous printing operation. Hence the underlying feature or principle of my improvement lies in providing a compensating gear mechanism which will allow the driven rotary member or cylinder to rotate independently of its gear in at least one direction during that part of its cycle when such member may be driven from another source of power.

While the construction herein shown and described embodies the invention in a preferred form, it will be understood that changes and variations may be made in the various parts and their arrangement without departing from the principles and scope of the invention or sacrificing its chief advantages.

I claim as my invention:—

1. In a compensating gear mechanism, a rotary driven member, a drive gear carried thereby, means comprising a spring of heavy compression between said member and gear to rotate the member in one direction, a spring connection of relatively less compression between said member and gear to bring the former into normal rotary relation with the gear whenever said member is rotated out of said relation in an opposite direction, and means for adjusting the compression of either of said springs independently of the other.

2. In combination, a drive gear, a coacting driven gear, a rotary member carrying said driven gear and set to rotate in predetermined relation with said driven gear, a spring of heavy compression between said driven gear and member to rotate the latter in one direction, means for rotating said member

apart from both said gears, and means for yieldingly allowing said member to have an opposite movement with respect to said driven gear only when driven separately by said member-rotating means.

3. In combination, a drive gear, a coacting driven gear, a rotary member carrying said driven gear and set to rotate in predetermined relation with said driven gear, a spring of heavy compression between said driven gear and member to rotate the latter in one direction, means for rotating said member in the same direction apart from both said gears, and means for yieldingly allowing said member to have an opposite movement with respect to said driven gear only when driven separately by said member-rotating means.

4. In combination, a drive gear, a coacting driven gear, a rotary member carrying said driven gear and set to rotate in predetermined relation with said driven gear, a spring of heavy compression between said driven gear and member to rotate the latter in one direction, means for rotating said member apart from both said gears, and a spring of less compression for yieldingly allowing said member to have an opposite movement with respect to said driven gear only when driven separately by said member-rotating means.

5. In combination, a drive gear, a coacting driven gear, a rotary member carrying said driven gear and set to rotate in predetermined relation with said driven gear, a spring of heavy compression between said driven gear and member to rotate the latter in one direction, means for rotating said member in the same direction apart from both said gears, and a spring of less compression for yieldingly allowing said member to have an opposite movement with respect to said driven gear only when driven separately by said member-rotating means.

6. In combination, two coacting rotary members, a drive gear associated with one of said members, resilient means arranged between said gear and its members for normally rotating the latter in predeterminedly yielding relation with said gear, and a yielding connection between said gear and said driven member to allow the latter to have an opposite movement with respect to said gear only when rotated by the other rotary member.

7. In combination, a drive gear, a coacting driven gear, a rotary cylinder loosely carrying said driven gear connected thereto to rotate in predetermined relation therewith, a yielding connection of heavy compression between the driven gear and cylinder to rotate the latter in one direction, means for rotating said cylinder apart from both said gears, and means for yieldingly allowing said cylinder to have an opposite movement with respect to said driven gear only when separately driven by said rotating means.

8. In combination, two coacting rotary cylinders, a drive gear associated with one of said cylinders, resilient means arranged between said gear and its cylinder for normally rotating said cylinder in predeterminedly yielding relation with said gear in one direction, and a yielding connection between said gear and said driven cylinder to have an opposite movement with respect to the gear only when actuated by the other cylinder.

9. In combination, two coacting rotary cylinders, a drive gear associated with one of said cylinders, means between said gear and its cylinder for normally rotating the latter in one direction, and means for allowing said driven cylinder to rotate independently of the gear when actuated by the other cylinder, said last means restoring the normal relation of said gear and cylinder when the latter is not actuated by the other cylinder.

10. In combination, a pair of rotary cylinders having their surfaces in rolling contact during part of their cycle, a drive gear carried by one of said cylinders, a yielding connection between said driven gear and its cylinder to rotate the latter when the cylinders are out of contact, and means for allowing said driven cylinder to rotate independently of its gear when said cylinders are brought into rolling contact.

11. In combination, a pair of rotary cylinders having their surfaces in rolling contact during part of their cycle, a drive gear carried by one of said cylinders, a yielding connection between said driven gear and its cylinder to rotate the latter when the cylinders are out of contact, and means for allowing said driven cylinder to rotate independently of its gear in one direction when said cylinders are brought into rolling contact and in the opposite direction when said cylinders are out of rolling contact.

12. In combination, two coacting rotary cylinders, a drive gear carried by one of said cylinders and rotatable independently thereof, a connection between said gear and its cylinder for driving the latter in predetermined relation with the gear, means for actuating said cylinders in unison independently of said drive gear, and means for yieldingly holding said gear in operative relation with its cylinder while said cylinders are actuated in unison to restore the predetermined relation when said cylinder is again driven by its gear.

13. In combination, two coacting rotary cylinders, a drive gear carried by one of said cylinders and rotatable independently thereof, a yielding connection between said gear and its cylinder for driving the latter in predetermined relation with the gear, means for actuating said cylinders in unison independently of said drive gear, and adjustable means for yieldingly holding said gear in operative relation with its cylinder while said cylinders are actuated in unison to restore the predeter-

mined relation when said cylinder is again driven by its gear.

14. In combination, a rotary member, a coacting drive gear carried by and in predetermined relation with said member, means comprising a yielding connection between said member and gear for normally rotating said member in one direction, and a separate yielding connection of relatively less compression and said first yielding connection permitting said member to rotate in the same direction independently of said gear only when said member is separately actuated apart from the gear, said last yielding connection restoring the normal predetermined relation between said member and gear when the former is no longer separately actuated.

15. In combination, a rotary member, a drive gear connected thereto in predeterminedly yielding relation, separate means for rotating said member at an increased speed, and a spring connection acting only in one direction for restoring predetermined relation between said member and said gear whenever said rotating means is out of operative engagement with said member.

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