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SHEET ADVANCING DRIVE FOR PRINTING PRESSES

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Fig. 1.

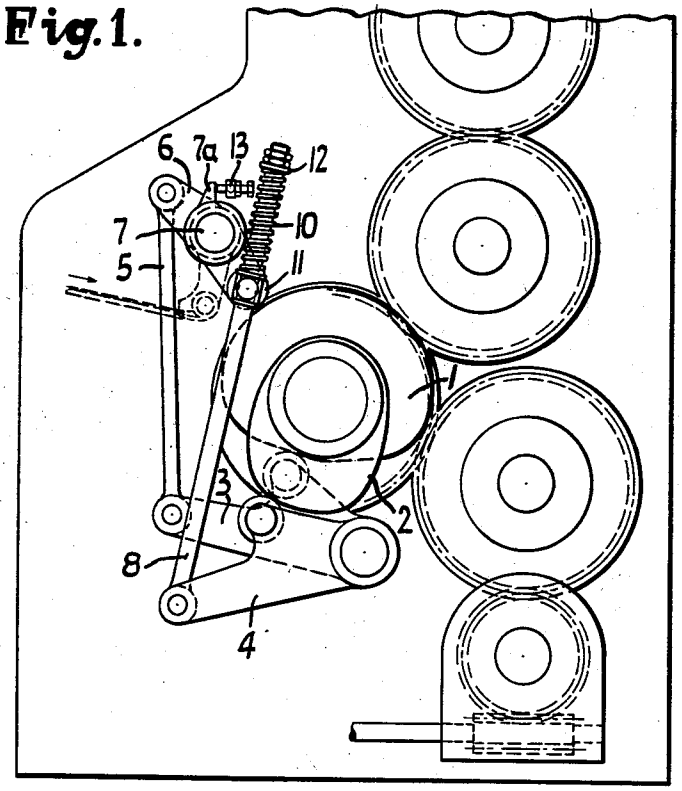


Fig. 2.

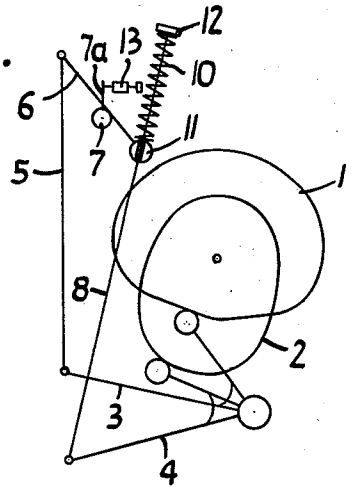
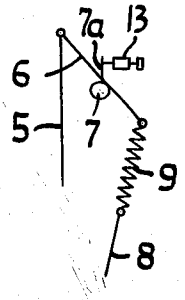


Fig. 3.



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SHEET ADVANCING DRIVE FOR PRINTING PRESSES

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This invention relates to the driving means for a sheet transfer or advancing drive for a printing press. In this kind of a drive, the swing gripper for the sheet advancing is turned by two eccentrically moving rocker arms mounted on the same side of the press, which rocker arms are constantly urged against the drive cams by a spring in order to eliminate the play in the drive mechanism.

In a sheet printing press, it is conventional to transfer the blank sheet from the stacking table of the press by means of a forward and back grasping device onto a cylinder moving at an equal speed or onto a drum lying in front of a cylinder. The sheet of paper lying at rest on the stack must be accelerated as quickly as possible to the velocity of the circumferential surface of the cylinder and also must be offered to the gripping device on the cylinder in a position which is always the same with regard to the cylinder. In order to obtain the proper register in the printing of several colors, one on top of the other, by running each sheet through the press several times, the delivery or transfer of the sheet from the grasping device to the cylinder must take place always in exactly the same position and even when the speed of the printing press is changed.

Since modern printing presses ordinarily have a high printing speed and because of the use of printing cylinders as small as possible in diameter in order to save expense, only a very small percentage of the time for one revolution of the cylinder is available for coaction with the sheet transfer device which results in that large forces due to the high accelerations and stoppings of the transfer device prevail.

Sheet transfer devices are well known in which gear trains, planetary gears or a reciprocating arm slidable in a slot are used for obtaining the forward and back movement.

On the other hand, the forward movement of the transfer device has been obtained by means of only one rocker arm which is moved eccentrically on a cam surface, and is joined to the transfer device either by means of a gear train or a pull rod. Tension springs are used to obtain the return or back movement and also to hold the rocker arm against the cam surface. Such springs are connected at one end to the press frame and at the other end either to the swing gripper shaft or the rocker arms. Alternatively, instead of joining the spring to the press frame, a second rocker arm is employed which follows another cam curve lying on the same side as the first cam curve in such a way that the strength of the spring between the two arms has a tension which is uniform or adapts itself to the forces arising during the operation of the drive mechanism. However, the shaft of the swing gripper in this case is actuated by means of a single pull rod joined to one of the rocker arms so that any play between the two joints of the pull rod is not balanced out.

The existence of such play or movement by reason of the forces arising during the operation of the transfer device is very disadvantageous in that, when the printing press speed is changed, a corresponding change occurs in the relative position of the sheet transfer device. Attempts have been made to correct this fault by using so-called register teeth which force a synchronization between the transfer device and the cylinder at the moment

the sheet is transferred. However, such teeth must be very carefully fitted and are subject to constant wear and tear which means a frequent replacement of the same.

Pull pressure or torsion springs have been installed between the swing gripper shaft and the press frame in an effort to control the play between the joints of the pull rod. Because of the great angle of turn of the swing gripper shaft for the transfer, very high spring forces occur at the upper dead point of the shaft which forces produce a high back-pressure between the rocker arm and the cam. Such back-pressure disturbs the uniform running of the whole press since the rocker arm follows the curve of the cam and produces the effect that the drum preceding the printing cylinder is trying to cooperate with a force which in each revolution of the cylinder is directed first in one and then in the opposite direction. The fluctuations in the velocity of revolutions of the cylinder or the drum must be absorbed by the fly wheel mass of the cylinder or by the rotational forces on the other moving parts of the press. In small printing presses having therefore smaller rotating masses, an oscillation of the whole press takes place which produces serious difficulties in printing techniques.

Another known guiding mechanism for the sheet transfer device attempts to eliminate play by connecting the rocker arms with each other by means of a spring, the rocker arms being joined to the swing gripper shaft for actuating the same. In this case, the drive cams and rocker arms are mounted on opposite sides of the press and since teeth segments are used to actuate the pull rod joined to the transfer device, such construction is not suitable for large presses because of lack of installation space. Moreover, a rack and pinion drive is subject to considerable wear and tear which influences the proper register for the sheets.

A drive mechanism in which the swing gripper shaft for the sheet transfer which is actuated by two eccentrically moving rocker arms arranged on the same side of the press frame and having the rocker arms consistently spring-pressed against the cams, the aforesaid disadvantages are avoided according to this invention and a drive mechanism free of play achieved by actuating the swing gripper shaft by means of two pull rods connected to the rocker arms with one of the pull rods having a spring installed therein so that the two pull rods work against each other. By this means, the swing gripper shaft follows, during its backward movement, the movement which is given by one cam, or the counteracting cam, so that the movement is free of any play in the joints by reason of the spring pressure. This structure is inexpensive and space saving. In addition, this invention uses simple parts which are capable of resisting wear and tear and need little maintenance so that the value and use of the press is raised substantially.

The pull rods are preferably connected to the two opposite ends of the double arm lever secured to the swing gripper shaft for the transfer. Since the spring pressure is adjusted so that it is greater than any force produced during one complete rotation of the transfer device, the play possible in the various joints at any position of the driving mechanism does not have any effect since the joint pins are always placed against the same spot in the wall of the bearing by the spring pressure. Off-register of the sheet due to change in press speeds is avoided without using an additional spring force on the sheet transfer mechanism itself which would have to be increased with each forward or backward movement to many times the created force in older mechanisms. Only the accelerating and retarding forces which occur in the reverse movement of the transfer device and the swing gripper shaft have any effect on the cams and these forces are alter-

nately absorbed by the two cams as pressure forces from the rocker arms. By correctly choosing the reversing point of the rocker arms, the circumferential component of the pressure force that arises according to the corresponding position of the angle of the cam can be relatively small. The turning moment that is created in the cams by the circumferential component is alternately applied to the two cams, and because of the two parallel rocker arms, it has an effect always toward the direction of rotation of the cams so that an almost uniform holding effect is achieved which forces the driving gears for the cams into a constant contact position with the driving teeth surfaces.

As the spring pressure is adjustable, a pre-stressing within the driving bars can be given so that the forces are exceeded but slightly and that therefore no needlessly high bearing pressure is produced in the joints. Due to the arrangement of the spring on the return stroke side of the swing gripper and an adjustable stop, the spring is locked more strongly in the stop position and the swing gripper is pressed heavily against the stops which eliminates any vibration when transferring the sheet.

The means by which the objects of the invention are obtained are described more fully with reference to the accompanying schematic drawings, in which:

FIGURE 1 is a side elevational view of the drive for the sheet transfer device;

FIGURE 2 is a schematic view of the drive shown in FIGURE 1;

FIGURE 3 is a view of a modification of FIGURE 2.

As shown in FIGURES 1 and 2, a cam 1 and a counteracting cam 2 are driven in the same direction from the press cylinder or the preliminary drum and each cam actuates, respectively, its rocker arm 3 and 4. The forward movement of the transfer device is given by cam 1 actuating rocker arm 3. Arm 3 is connected to a rigid pull rod 5 which, in turn, is joined to the free end of the double arm lever 6 fastened to the swing gripper shaft 7. The opposite end of lever 6 is joined to a pull rod 8 which, in turn, is connected to rocker arm 4. Pull rod 8 slides through a slotted guide 11 secured to the end of double arm lever 6 so that spring 10 is under compression between the guide 11 and the adjustable abutment 12 secured to the outer end of rod 8. This modification has the advantage in that, if spring 10 should break, no damage is done to the rest of the drive mechanism.

In the modification of FIGURE 3, the compression spring 10 of FIGURES 1 and 2 is replaced by a tension spring 9, which forms a part of pull rod 8 and thus this invention produces a power connected transmission. The effect is the same as that obtained in FIGURES 1 and 2.

An adjustable stop 13 is mounted adjacent swing gripper shaft 7 so as to limit the movement of the arm 7a secured to shaft 7. Consequently, at the end of the reverse stroke of the transfer device, an additional tensioning or compressing of the springs 9 and 10 respectively is obtained.

Having now described the means by which the objects of the invention are obtained,

I claim:

1. In a printing press, a drive for a sheet advancing device comprising two drive cams, two rocker arms engaging said cams, respectively, a swing gripper shaft, a double arm lever fastened to said gripper shaft for turning said shaft alternately in opposite directions, a first pull rod connecting one of said rocker arms to one end of said double arm lever, a second pull rod joined to the other of said rocker arms and slidably engaging the other end of said double arm lever, and a spring interconnecting said second pull rod and said other end of said double arm lever for spring linking the pull rods together through said double arm lever to prevent play in the drive for said swing gripper shaft.

2. In a printing press as in claim 1, said second pull rod and said spring being on the reverse movement side of said gripper shaft.

3. In a printing press as in claim 2, further comprising stop means for limiting the extent of the reverse movement of said gripper shaft and for strengthening the force of said spring means.

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