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(54) TURNING DRUM FOR CONVERTIBLE PERFECTING PRINTING PRESSES

(71) We, HEILDELBERGER DRUCKMASCHINEN AKTIENGESELLSCHAFT, a body corporate organised under the laws of Germany, of 69 Heidelberg, Alte Eppelheimer Strasse 15—21, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a turning drum for convertible perfecting printing presses, which is provided with tongs type grippers which are pivotable about a pivot and whose two halves are adapted to be controlled by separate drive elements.

In one known turning drum of this kind (German Patent Publication DOS 24 14 989) the halves of the tongs type grippers are controlled separately, each from one side of the drum. One half of the tongs type gripper is fastened on a shaft and the other on a tube which coaxially surrounds the shaft. The shaft and the tube are controlled by gears disposed on respective opposite sides of the drum. Toothed drive elements, which are pivotable about pivot pins, mesh with the gears.

Each drive element is provided with a roller which co-operates selectively with two control cams. The rollers are disposed on the two drive elements on the right of the pivot pin of the latter in the one case and on the left in the other case, viewed in the peripheral direction. The rollers on both sides are pressed against the control cams by strong spring force applied by compression springs between the drum body and the drive elements.

The drive elements of the known turning drum control the tongs type grippers by means of the control cams in such a manner that for opening and closing purposes the two tongs gripper halves are moved simultaneously, and that during the pivoting of the tongs grippers for perfecting the two

tongs gripper halves also perform a parallel pivoting movement.

In particular the pivoting movement of the tongs grippers for perfecting, amounting to about 180°, necessitates maximum pivoting of the drive elements by means of the control cams. The compression springs applying pressure to the rollers are thereby stressed over a long spring deflection, so that the spring pressure varies accordingly.

The fluctuations of the spring forces in the known arrangement entail the disadvantage that they may act as additional driving or retarding forces on the drum drive and thus effect its uniform rate of rotation. The fluctuations of torque resulting therefrom during printing may also result in mackling. In addition, additional vibrational impulses, which may result in increased wear, occur in the printing press.

The invention seeks to overcome these shortcomings and to apply the necessary forces without noteworthy torque fluctuations or vibrations in the turning drum, and thus to increase the output of the machine.

According to the invention there is provided a turning drum for a convertible perfecting printing press, comprising gripper tongs which are pivotable about a pivot axis, separate drive elements for respective halves of the gripper tongs, and bracing means acting between the drive elements for resiliently bracing the gripper tongs halves against one another.

By resiliently bracing the drive elements against one another it is ensured that the bearing forces of the rollers on the control cams do not vary when the two halves of the tongs type grippers are pivoted for perfecting. In this phase the two halves of the grippers move parallel to one another. Only for the purpose of opening and closing the tongs grippers is there a slight variation of the bearing forces, but this cannot have a negative action of the rotary movement of the turning drum. Moreover, because of the

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constant bearing force of the rollers there are practically no variations of torque on the turning drum drive, so that vibrations are avoided and the driving forces can be reduced, which results in smooth running and increased output of the machine.

In an advantageous embodiment of the invention a prestressed torsion bar spring is disposed between the drive elements of the two halves of the tongs type gripper. For the solution of the problem posed this provides an embodiment which requires only little space inside the body of the turning drum.

The torsion bar spring is held in spring bearings on the pivot pins of the two drive elements and is disposed in a depression in the turning drum, the spring bearings having a slit and being fastened on the pivot pins. In order to prevent the soiling of the torsion bar springs and their mounting in the drum, they are covered by a filling element which closes the depression in the drum.

One exemplary embodiment of the invention is diagrammatically illustrated in the drawings, in which:

Figure 1 is a side view of the turning drum with sheet transfer for recto printing.

Figure 2 is a side view of the turning drum with pivoting tongs type gripper.

Figure 3 is a side view of the turning drum with sheet transfer for perfecting, and

Figure 4 is a longitudinal section through the turning drum.

In the embodiment shown in the drawing the turning drum 1 is disposed between a transfer drum 2 and an impression cylinder 3. On its periphery the transfer drum 2 has two diametrically opposite gripper systems 4, by means of which the sheets 5 are taken from a first printing unit. For the sake of clarity the first and subsequent printing units are not shown in the drawings.

In Figure 1 the sheet 5 is gripped at its front edge by the tongs type grippers 6 and guided around the turning drum. After about half a revolution of the drum it is similarly transferred to the grippers (not shown) of the impression cylinder 3. On the latter it is given the second impression on the same side in the case of recto printing. For the purpose of transferring the sheet 5 the tongs type gripper is pivoted approximately radially out of the periphery of the turning drum and pivoted back again to receive the next sheet. The maximum pivoting movement is shown in Figure 2. The pivoting of the tongs type grippers is for this purpose effected in the open state as shown by the lines 7 in Figure 1.

The tongs type gripper 6 is composed of the gripper halves 8 and 9, of which the gripper half 8 is fastened on a shaft 10 and the other gripper half 9 is fastened on a

tube 11 coaxially surrounding the shaft 10. For the purpose of controlling the gripper half 8 a gear 12 is fastened on the shaft 10 on one side of the drum, and for controlling the other gripper half 9 a gear 13 is fastened on the tube 11 on the other side of the drum (Figure 4). The two gears 12 and 13 are driven separately, one from each side of the drum, by means of drive elements 14 and 15 whose toothing 16 meshes with the gears 12, 13. At the centre of the toothing 16 the drive elements 14, 15 are mounted on the turning drum for pivoting about coaxially extending pivot pins 17.

Each drive element 14, 15 is provided with a roller 18, 19, the roller 18 being mounted on the front side of the drum (Figure 1) on the right of the pivot pin 17 and the roller 19 on the rear side of the drum, on the left of the pivot pin 17. The two rollers 18, 19 are axially slidable and can selectively cooperate with two control cams 20, 21. For the purpose of sliding the rollers 18, 19 clamp screws 22 are loosened, so that the roller pins 23 together with the rollers can be moved from one control cam to the other.

After the displacement of the rollers 18, 19, in perfecting work the tongs grippers 6 grip the end of the sheet 15 and convey it as shown by the lines 24 (Figure 3) around the turning drum 1, and give up the end of the sheet in correct register to the grippers of the impression cylinder. The sheet is thus turned, so that it can be printed on both sides, that is to say recto printing in the first printing unit and verso printing in the next printing unit. After the transfer the tongs grippers 6 move back to their starting position as shown by the lines 25. For this purpose they travel over an angle of about 180°. In order to permit free movement of the drive elements 14, 15 they are provided with cutouts 26 for the drum journals 27.

The opposite ends of the pivot pins 17 to that where the drive elements 14, 15 are disposed extend into a depression 28 in the turning drum 1, where they are provided with spring bearings 29 to receive a torsion bar spring 30. The torsion bar spring 30 is held by its bent-over ends 31 in slits 32 in the spring bearings 29.

The depression 28 together with the torsion bar spring 30 and spring bearings 29 disposed therein is covered by a filling element 33, which is fastened by means of screws 34 to the turning drum 1.

The torsion bar spring 30 is prestressed by the angle α and thus through the mutual bracing of the two drive elements 14, 15 produces the bearing force of the two rollers 18, 19. A prerequisite for this is that the two rollers 18 and 19 should be disposed on opposite sides in relation to the pivot pins

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17. For the purpose of opening and closing the two tongs gripper halves 8 and 9 the angle α varies by only about 3° . This is achieved through the high transmission ratio between the toothing 16 and the gears 12, 13.

For the pivoting movement of the tongs grippers 6, particularly for perfecting work where it amounts to about 180° , no additional angular movement is necessary on the torsion bar spring 30, because the two tongs grippers halves 8 and 9 always move parallel. Thus, in the lower region of the turning drum 1 the parallel pivoting movement of the tongs grippers in the closed state is necessary in order to hold the sheet. In the upper region of the turning drum 1 the sheet 5 has already been given up to the impression cylinder 3 and the tongs gripper halves 8 and 9 are open (Figure 2). Here again their pivoting movements are parallel, that is to say the opening width of the two tongs gripper halves 8 and 9 is not changed. Thus only a common pivoting of the two drive elements 14 and 15 takes place, and this pivoting is followed by the torsion bar spring 30 without varying its prestressing. The pivoting is achieved by corresponding conformation of the two control cams 20 and 21.

The pivoting movement of the tongs gripper halves 8 and 9 for recto printing, as shown by the lines in Figure 1, also takes place in the same manner, that is to say the tongs gripper 6 remains open in the upper region of the turning drum 1 until the next sheet 5 is received. Here again the angle α varies by only about 3° in the opening and closing of the two gripper halves 8 and 9.

WHAT WE CLAIM IS:—

1. A turning drum for a convertible perfecting printing press, comprising gripper tongs which are pivotable about a pivot axis, separate drive elements for respective halves of the gripper tongs, and bracing means acting between the drive elements for resiliently bracing the gripper tongs halves against one another.

2. A turning drum according to claim 1, wherein the bracing means comprises a prestressed torsion bar spring which is disposed between the drive elements of the two gripper tongs halves.

3. A turning drum according to claim 2, wherein the torsion bar spring is held in spring bearings on the pivot pin of the two drive elements and is disposed in a depression in the turning drum.

4. A turning drum according to claim 3 wherein the spring bearings have a slit and are fastened on the pivot pins.

5. A turning drum according to claim 3 or claim 4, wherein the torsion bar spring is covered by a filling piece which closes the depression in the turning drum.

6. A turning drum for a convertible perfecting printing press substantially as hereinbefore described with reference to the accompanying drawings.

7. A convertible perfecting printing press including a turning drum according to any one of the preceding claims.

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3. A turning drum according to claim 2, wherein the torsion bar spring is held in spring bearings on the pivot pin of the two drive elements and is disposed in a depression in the turning drum.
4. A turning drum according to claim 3 wherein the spring bearings have a slit and are fastened on the pivot pins.
5. A turning drum according to claim 3 or claim 4, wherein the torsion bar spring is covered by a filling piece which closes the depression in the turning drum.
6. A turning drum for a convertible perfecting printing press substantially as hereinbefore described with reference to the accompanying drawings.
7. A convertible perfecting printing press including a turning drum according to any one of the preceding claims.

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