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(54) DRIVE SYSTEM FOR ROTARY PRINTING PRESSES

(71) We, HEIDELBERGER DRUCK-
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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 drive system for
rotary printing presses, more particularly
web-fed rotary offset printing presses in
series arrangement with a main drive system
for the printing units and with, for each, two
blanket cylinders in mutual contact, each of
which co-operates with a plate cylinder, while
each plate cylinder is driven individually by
the main drive system.

When operating such offset printing presses
with two blanket cylinders in mutual contact,
so-called blanket-blanket presses, certain
problems arise when printing high quality
work, the causes of which, due to the press,
are attributable inter alia to the drive system.
The main problem of this press is that the
web printed in the first printing unit must
exhibit practically no deviation in its relative
position to the blanket and plate cylinders in
each further printing unit. If such a positional
deviation occurs, then this leads to what is
called doubling. Where high standards are
imposed on the printing result, doubling
cannot be accepted, with the result that there
is an increased amount of paper wastage.

The cause for the doubling which exists
with known drive systems is to be found in
rotational errors of the individual cylinders
of a printing unit and also in rotational errors
of a first printing unit with reference to the
further printing units. Thus such printing
errors may arise, e.g. from a twisting of the
longitudinal shaft under the influence of the
drive force with an increase from one printing
unit to the next. Rotational errors also occur
with the angle transmissions, e.g. bevel

gears, which are customarily used at present,
due to the inaccuracies of production which
exist in them.

In another proposal (DT-PS 2 014 753) a
brake device is provided on each blanket
cylinder in order to overcome the problems
of the bevel gear transmissions used there,
namely avoiding the backlash which occurs
in the drive gears under fluctuating loads.
In this case the drive occurs in each case
through bevel gear transmission to the plate
cylinders and from there to the respectively
last links of the drive chain and on to the
blanket cylinders.

The brake devices on the blanket cylinders,
which are intended by the braking moment
which they exert to prevent the backlash in
the numerous bevel gear sets and produce a
tooth flank change, constitute an additional
mechanical outlay in the press, which is
reflected in correspondingly increased costs.
A further additional cost factor of consider-
able importance is however the additional
power which has to be exerted by the drive,
which has to be converted by the brake
devices into wasted heat which is in fact
detrimental to the printing unit. This results
not only in considerable energy costs, but also
in additional wear to all the driving and
transmission elements.

Another known construction (DT-OS
2260 147) attempts to eliminate doubling, due
to rotational errors, in that all the printing
units lie one behind the other in a drive chain
continuous from the first to the last printing
unit, and that at the end of this drive chain,
i.e. opposite the initiation of the drive forces,
a brake device is arranged. Here again, in
order to transmit the driving forces between
the individual printing units, longitudinal
shafts are used which transmit the driving
forces between the individual plate cylinders
of the printing units through bevel gear
transmissions and lay gears. The wear, and
hence the backlash in the large number of
tooth meshings, is further increased by the
braking device. This construction also

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provides a solution in which, in addition to substantial backlash in the driving gear chain, necessitates an additional outlay for mechanical means, for wear to gears and for energy costs for driving the press.

Such an outlay in conjunction with a high cost burden is intolerable more particularly for small format printing presses. It is the aim of the invention to produce a drive system which is optimally free from rotational errors, and has little backlash and low wear, with the minimum of technical outlay on the printing press and with the lowest possible energy consumption to operate the printing press.

This is achieved according to the invention in that, as main drive system, there are associated with each printing press two meshed spur gears which are in mesh with the spur gears of the main drive system of the respectively adjacent printing unit and each plate cylinder drive gear meshes with one of the two spur gears, while each plate cylinder is coupled to the associated blanket cylinder through a further pair of spur gears which is located beside the main drive in another gear line.

The application therefore uses as main drive system a gear train with two spur gears per printing unit, which can be manufactured with very high precision for a relatively low production cost. By virtue of this high precision of production, the gears of the drive system can largely be adjusted free from backlash. The known bevel gear sets, even for a considerably higher technical and financial outlay, can at best be manufactured in a grade of quality which is at least one grade lower than for spur gears. The tooth-
ing errors which are consequently present in the bevel gears are immediately expressed as rotational errors. Moreover, the construction according to the invention necessitates altogether fewer tooth meshings and no additional brake devices, so that the invention creates an inexpensive and rigid drive system free from backlash, in which no disturbing rotational errors can arise and doubling is thereby eliminated.

In an advantageous further development of the invention, the diameters of the two spur gears of the main drive system together correspond approximately to the interval of the printing units. Lay gears and consequent additional tooth meshings are avoided by the use of the two large spur gears.

For an exact regulation of the peripheral register, the two spur gears of the plate cylinders of each printing unit may be provided with a peripheral adjustment for plate and blanket cylinders. In a further development of the invention, the plate cylinder drive gears are disengagable from the spur gears of the main drive system by axial sliding in order that each printing unit can be uncoupled

from the drive system of the printing press and stopped.

In a further advantageous development of the invention, the spur gears of the mutually contacting blanket cylinders are mutually in mesh and the closed gear train constituted by the two spur gears of the main drive system, the plate cylinder drive gears and the two pairs of spur gears of the plate and blanket cylinders is tensioned by a mutual rotation of the plate cylinder drive gear with reference to the spur gear for driving the blanket cylinder. By this means all these spur gears of a printing unit can be brought into definite flank contact, i.e. mutually tensioned and adjusted free from backlash, without additional expensive and energy-consuming means being necessary. The backlash-free adjustment of the tooth meshing of the spur gears of two adjacent printing units is effected in known manner by adapting the printing unit interval to the tooth engagement.

Two exemplary embodiments of the invention are illustrated schematically in the accompanying drawings, wherein:—

Fig. 1 shows a side elevation of the printing press

Fig. 2 shows a side elevation of a printing unit

Fig. 3 shows a partial cross section through the drive system

Fig. 4 shows a partial cross section through the drive system with plate cylinder drive gears in mesh.

The exemplary embodiment according to Fig. 1 shows a web-fed rotary offset printing press which comprises the printing units 1, 2, 3 and 4. The paper web 5 is passed through these approximately horizontally in the direction of the arrow. The printing unit 1 receives the paper web from a reel support, not shown, and the printing unit 4 feeds it e.g. to a drying unit, not shown. The machine illustrated is a so-called blanket-blanket printing press, on which the paper web is passed through between the blanket cylinders 6, 7 and printed in each case.

Each of the two blanket cylinders 6, 7 co-operates with a plate cylinder 8, 9. With each plate cylinder there is associated a plate cylinder drive gear 10, 11, each of which is in mesh with a spur gear 12, 13 of the main drive system. In the exemplary embodiment illustrated, the drive gear 10 is in mesh with the spur gear 12 and the drive gear 11 with the spur gear 13. As a main drive system in this case, two meshed spur gears 12, 13 are associated with each printing unit.

The spur gears 12, 13 of the main drive system of a printing unit are respectively in mesh with the spur gears of the main drive system of the adjacent printing unit. In the exemplary embodiment illustrated, therefore, the spur gear 13 of the printing unit 1 is in mesh with the spur gear 12 of printing unit 2,

which is in turn in mesh with the spur gear 13 of printing unit 2. The same meshing conditions exist between the printing units 2 and 3 and the printing units 3 and 4.

5 The drive motor 14 which drives the spur gear 13 of the printing unit 2 through lay gears 15, 16, is provided between the printing units 2 and 3.

10 Beside the plate cylinder drive gear 10 or 11 there is present, in another gear line, a spur gear 17 which couples the plate cylinder through the intermediary of a further spur gear 18 to the blanket cylinder. Thus each pair of plate-blanket cylinders 6, 8 and 7, 9 is coupled by a pair of spur gears 17, 18 through the intermediary of the plate cylinder drive gears 15 10 and 11 to the spur gear 12 or 13 of the main drive system.

20 The exemplary embodiment according to Fig. 2 illustrates a side frame 19 of a printing unit in which the cylinders and rollers are mounted. The inking units 20 and the damping unit 21, which is associated with each plate cylinder 8, 9, is also shown.

25 Fig. 3 illustrates how the plate cylinder drive gears 10, 11 are arranged on the stub axles 22, 23 and the spur gears 17 on the stub axles 22, 23 and 24. For the purposes of starting and stopping printing, the two blanket cylinders 6, 7 are pivotable in their bearings so that they can be moved into and out of contact with the two plate cylinders 8, 9 and also mutually. The bearing means provided for this purpose is not shown in the drawing.

30 The plate cylinder drive gears 10, 11 are also provided with a peripheral register adjustment, not shown, by which, in the example according to Fig. 3, the respective pair of plate-blanket cylinders can be rotated. This is made possible by the arrangement of the two spur gears 17, 18 of each pair of plate-blanket cylinders 8, 6 and 9, 7 in another gear line. But it is also conceivable to arrange the two pairs of gears 17, 18 in one gear line and to execute them with corresponding profile displacement so that no meshing exists between the two spur gears 18. The two pairs of gears 17, 18 are also arranged in a different gear line from the main drive system gears 12, 13 and the plate cylinder drive gears 10, 11.

50 The spur gears 12, 13 of the main drive system are mounted on the side frame 19 through the intermediary of roller bearings 25 and journals 26. The diameters of the two spur gears 12 and 13 correspond approximately to the interval of the printing units 1, 2 or 2, 3 or 3, 4 because for design reasons they are not arranged in one line and therefore the interval does not correspond exactly to their diameter.

60 Mounted on the side frame 19 by stay bolts 27 is a trunnion 28 which carries a screwthreaded flange 29. A screwthreaded pin 30 is provided rotatably in the latter, and through a coupling 31, displaces the plate

cylinder drive gear 10 or 11 axially upon a known shaft connection not shown, and disengages it from the spur gear 12 or 13 of the main drive system (position shown by chain dotted lines). By disengaging the plate cylinder drive gear 10 or 11, the plate cylinder-blanket cylinder pair 8, 6 or 9, 7 is stopped. 70

The exemplary embodiment according to Fig. 4 differs from Fig. 3 in that the two spur gears 18 of the blanket cylinders 6 and 7 are arranged in one line and are in mesh, so that a closed gear train is created comprising the two spur gears 12, 13 of the main drive system, the plate cylinder drive gears 10, 11 and the two pairs of spur gears 17, 18 of the plate and blanket cylinders. Here again a peripheral register adjustment, not shown, is provided on the stub axles 22, 23 of the plate cylinders 8 and 9, but rotates only the respective plate cylinder 8 or 9. For the purpose of uncoupling by means of the screwthreaded pin 30, in this construction the plate cylinder drive gears 10, 11 are slid axially conjointly with the spur gears 17. The disengagement occurs between the plate cylinder drive gear 10 and spur gear 12, and between the plate cylinder drive gear 11 and spur gear 13. In each case the spur gear 17 remains in mesh with the associated spur gear 18. Owing to the closed gear train, both plate cylinder drive gears 10, 11 are disengaged in this embodiment. 85 90 95

After slackening the clamp grooves 32, the plate cylinder drive gear 10 can be rotated with reference to the spur gear 17 by means of the eccentric bolt 33. By this means the closed gear train comprising the two spur gears 12, 13 of the main drive system, the plate cylinder drive gears 10, 11 and the two pairs of spur gears 17, 18 of the plate and blanket cylinders can be tensioned. This tensioning has the effect that a change of tooth flanks cannot occur at any tooth meshing of the drive and cylinder gears of a printing unit. The tensioning is effected in the direction of the normal acting drive forces. The uncoupling of the plate cylinder drive gears 10, 11 occurs during standstill of the printing press with blanket cylinders 6, 7 out of contact and thus not with the gear train tensioned, since adequate tooth play is created by the disengagement of the blanket cylinders. 100 105 110 115

WHAT WE CLAIM IS:—

1. A rotary printing press comprising a plurality of printing units arranged in series, each unit including two blanket cylinders in mutual contact, each of which co-operates with a respective plate cylinder, a main drive system for the unit comprising two mutually meshing spur gears for each of the units which are in mesh with the spur gears of the or each adjacent printing unit and a drive gear for each plate cylinder of each unit meshing with respective ones of the two spur gears associated with that unit, each plate 120 125



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which is in turn in mesh with the spur gear 13 of printing unit 2. The same meshing conditions exist between the printing units 2 and 3 and the printing units 3 and 4.

- 5 The drive motor 14 which drives the spur gear 13 of the printing unit 2 through lay gears 15, 16, is provided between the printing units 2 and 3.

- 10 Beside the plate cylinder drive gear 10 or 11 there is present, in another gear line, a spur gear 17 which couples the plate cylinder through the intermediary of a further spur gear 18 to the blanket cylinder. Thus each pair of plate-blanket cylinders 6, 8 and 7, 9 is coupled by a pair of spur gears 17, 18 through the intermediary of the plate cylinder drive gears 10 and 11 to the spur gear 12 or 13 of the main drive system.

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- 50 The spur gears 12, 13 of the main drive system are mounted on the side frame 19 through the intermediary of roller bearings 25 and journals 26. The diameters of the two spur gears 12 and 13 correspond approximately to the interval of the printing units 1, 2 or 2, 3 or 3, 4 because for design reasons they are not arranged in one line and therefore the interval does not correspond exactly to their diameter.

- 60 Mounted on the side frame 19 by stay bolts 27 is a trunnion 28 which carries a screwthreaded flange 29. A screwthreaded pin 30 is provided rotatably in the latter, and through a coupling 31, displaces the plate

cylinder drive gear 10 or 11 axially upon a known shaft connection not shown, and disengages it from the spur gear 12 or 13 of the main drive system (position shown by chain dotted lines). By disengaging the plate cylinder drive gear 10 or 11, the plate cylinder-blanket cylinder pair 8, 6 or 9, 7 is stopped.

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WHAT WE CLAIM IS:—

1. A rotary printing press comprising a plurality of printing units arranged in series, each unit including two blanket cylinders in mutual contact, each of which co-operates with a respective plate cylinder, a main drive system for the unit comprising two mutually meshing spur gears for each of the units which are in mesh with the spur gears of the or each adjacent printing unit and a drive gear for each plate cylinder of each unit meshing with respective ones of the two spur gears associated with that unit, each plate



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cylinder being coupled to its associated blanket cylinder through a further pair of spur gears located beside the main drive system in another gear line.

- 5 2. A printing press according to claim 1 wherein the diameters of the two spur gears of the main drive system associated with each unit together correspond approximately to the interval between the printing units.

- 10 3. A printing press according to claim 1 or claim 2 wherein the plate cylinder drive gears are disengageable from the spur gears of the main drive system by axial displacement.

- 15 4. A printing press according to any one of claims 1 to 3 wherein the spur gears of the mutually contacting blanket cylinders are

mutually in mesh and the closed gear train comprising the two spur gears of the main drive system, the plate cylinder drive gears and the two pairs of spur gears of the plate and blanket cylinders may be tensioned by rotation of a plate cylinder drive gear with reference to the spur gear for driving the blanket cylinder.

5. A rotary printing press substantially as hereinbefore described with reference to Figures 1 to 3 or Figure 4 of the drawings.

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