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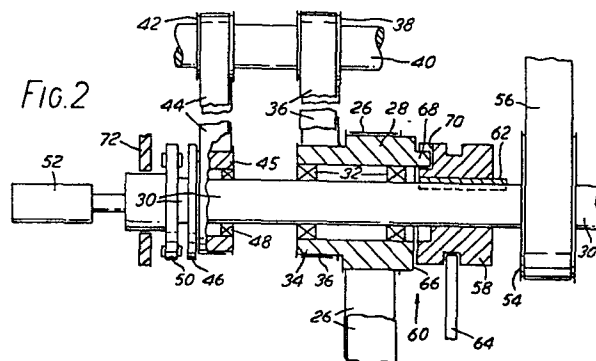
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(54) **Improvements relating to printing machines.**

(57) A printing machine has two printing cylinders (22) which are alternatively movable into and out of contact with the matter (12) to be printed. Both cylinders are drivable from the main drive (24) for the machine, and either can be engaged via a dog clutch (68,70) having a single tooth so as to fix the register between the main drive and the cylinder. An alternative drive (34,36,38,40,42,44,46) is used to bring the cylinder to slightly below its operating speed before engaging the dog clutch. Each cylinder is in contact with a common inking roller (16) when in its operative position, and there is also a common impression roller (14).



IMPROVEMENTS RELATING TO PRINTING MACHINES

This invention relates to printing machines, and particularly to printing machines having two printing
5 cylinders, either one of which can be printing onto a web running through the machine at any one time. By changing from one printing cylinder to the other, therefore, it is possible to vary the copy being printed onto the web, for example to change a title or address on a web for making
10 paper bags, or to change information such as prices in a brochure.

One problem in such machines is in synchronising the two printing cylinders when changing from one to the other. Not only must both cylinders be running at the
15 same speed as the web, but also it is necessary to ensure that the cylinder which is about to be brought into use is in the same register with respect to the web as the cylinder which is being taken out of use, or else the print from the cylinders will be out of register on the
20 web.

One aspect of the present invention provides a printing machine having a main drive for transporting matter to be printed through the machine, and two printing cylinders which are alternatively movable relative to the
25 matter to be printed into and out of operative printing positions, the two cylinders being each drivable from the main drive, each cylinder being provided with means for engaging it with and disengaging it from the main drive when it is in the inoperative position, said means
30 comprising a dog clutch, which is provided with only one tooth so as to fix the register between the main drive and the cylinder. Preferably there is an alternative drive for the cylinder (which may be derived from the main drive) which can be used to speed up the cylinder to a
35 speed slightly slower than its full operating speed before

engaging the dog clutch.

Prior art printing machines of the type first mentioned not only have two printing cylinders which can be alternatively rendered operative and inoperative, but
5 also two corresponding sets of inking rollers for supplying ink to the printing cylinder, and two impression rollers on the opposite side of the web from the printing cylinders.

A second aspect of the present invention provides a
10 printing machine having two printing cylinders which are alternatively movable relative to matter to be printed into and out of operative printing positions, each printing cylinder being in contact with a common inking roller when it is in its operative position. Preferably
15 also there is a common impression roller for the two printing cylinders, the two printing cylinders being on opposite sides of a line between the impression roller and the inking roller.

A printing machine embodying the invention will now
20 be described by way of example, with reference to the accompanying drawings, wherein:

Fig. 1 is a schematic side view of the machine,

Fig. 2 is a schematic cross-section of synchronising means for one printing cylinder of the machine, and

25 Fig. 3 shows schematically the layout of various parts of the machine.

Referring firstly to Fig. 1, there is shown within a casing 10 a "flying imprinter" forming part of a printing machine. A web 12 to be printed is passed around a single
30 impression roller 14. Below the impression roller 14 there is provided a single inking system comprising an ink tray 20, a pick-up roller 18 which picks up ink from the tray 20 and applies it to an inking roller 16. Two printing cylinders 22 are arranged one on each side of a line
35 between the inking system and the impression roller 14. The printing cylinders 22 are at a level intermediate the

impression roller 14 and the inking system, and are movable horizontally in tandem as indicated by arrow A-A. Thus, either of the printing cylinders 22 can be brought into contact with both the inking roller 16 and the web 12 wrapped round the impression roller 14, while the other is out of such contact. This means that at any one time either one or the other of the printing cylinders 22 can be receiving ink from the roller 16 and printing onto the web 12. The mechanism for moving the printing cylinder 22 in the direction of the arrow A-A (which is not shown in the drawings) may be so interlocked that for a short period during the changeover from one printing cylinder to the other both are in contact with the web 12 and inking roller 16. This will result in a few wasted copies in which the alternative messages on the two printing cylinders 22 are overprinted on each other, but this is not important.

The use of a single inking system and impression roller 14 in this manner results in a substantial economy as compared with prior art machines having two inking systems.

Each printing cylinder 22 can be driven from the main drive 24 (see Fig. 3) of the printing press, which is used also for transporting the web 12. For each printing cylinder 22, there is a drive belt 26 from the main drive 24, which is taken to a pulley 28 which is rotatably mounted around a shaft 30 by means of bearings 32. A pulley 34 is integral with the pulley 28, and a drive belt 36 takes the drive from the pulley 34 to a pulley 38 which is fast with a rotatable secondary shaft 40. The drive is then taken from a further pulley 42 on the secondary shaft 40 by a belt 44 to a pulley 45 which is also rotatably mounted on the shaft 30 by means of bearings 48 and which is fast with a friction clutch plate 46. A movable clutch plate 50 can be brought into frictional engagement with the clutch plate 46 from a neutral position as shown in

Fig. 2 by means of a pneumatic cylinder 52. The movable clutch plate 50 is keyed to the shaft 30 so that by engaging the clutch plates 46,50 the drive is transferred to the shaft 30. The gearing ratio provided by the belts 36,44 and the pulleys 34,38,42,45 is such that when the clutch plates 46,50 are engaged the shaft 30 runs at a slightly slower rotational speed than the pulley 28. The drive is then taken from the shaft 30 by a pulley 54 and belt 56 to the corresponding printing cylinder 22.

As the clutch plates 46,50 are engaged, therefore, the printing cylinder 22 is brought up to just below its full operating speed. The speed which it attains in this manner is suitably 95% of its full operating speed, though this is not highly critical. The gearing ratio may be arranged to give an even greater proportion of full operating speed for printing cylinders with a particularly high inertia.

One member 58 of a dog clutch 60 is keyed by a key 62 to the shaft 30 adjacent the pulley 28, so that the member 58 is constrained to rotate with the shaft 30 but can slide axially along it under the action of an operating lever 64. The other member of the dog clutch 60 is provided by one end face 66 of the pulley 28, which is provided with a single tooth 68 for engagement with a corresponding single recess 70 in the member 58. Once the printing cylinder 22 is running satisfactorily at slightly below its full operating speed, the lever 64 is operated to bring together the end face 66 of the pulley 28 and the member 58. At first, of course, the face 66 is rotating slightly faster than the member 58, but when the tooth 68 engages in the recess 70 they both run together. The speed of the shaft 30 is thus increased and the printing cylinder 22 is brought up to its full operating speed. The clutch plate 50 (which will now be slipping against the clutch plate 46) is now retracted into its neutral position

by means of the pneumatic cylinder 52, and the printing cylinder 22 can now be moved from its inoperative position in the direction of arrow A-A (Fig. 1) into its operative printing position. The other printing cylinder 5 22 is brought out of its operative position. It too has a mechanism exactly the same as in Fig. 2, and its dog clutch 60 is now disengaged. Its clutch plate 50 is then retracted still further away from the clutch plate 46, into frictional engagement with a stop plate 72, and this 10 brings the inoperative printing cylinder 22 to rest. The inoperative printing cylinder 22 can then be removed and changed as desired.

It will be apparent that because the printing cylinders when in their operative positions are driven 15 from the main drive 24 of the printing press, they will be maintained in synchronism with the web 12 without the need for complicated control devices such as tacho generators acting to control the speed of the printing cylinders. In addition, the single tooth 68 and recess 70 of the dog 20 clutch 16 mean that there is only one possible orientation in which the member 58 can engage with the pulley 28, and this ensures that the printing cylinder 22 is kept in the correct register with the web 12. To keep the synchronism and register correct, all the belts and pulleys are 25 toothed, and the pulley 54 is in 1:1 ratio with the printing cylinder 22.

The advantage of bringing the printing cylinder up to slightly below its full operating speed before engaging the dog clutch 60 is that this minimises the shock 30 experienced during this engagement. This is why printing cylinders with higher inertias may be brought up to a greater proportion of their full operating speeds before engagement of the dog clutch 60.

Among other modifications which could be made, 35 it would be possible for the printing cylinders 22 in Fig.

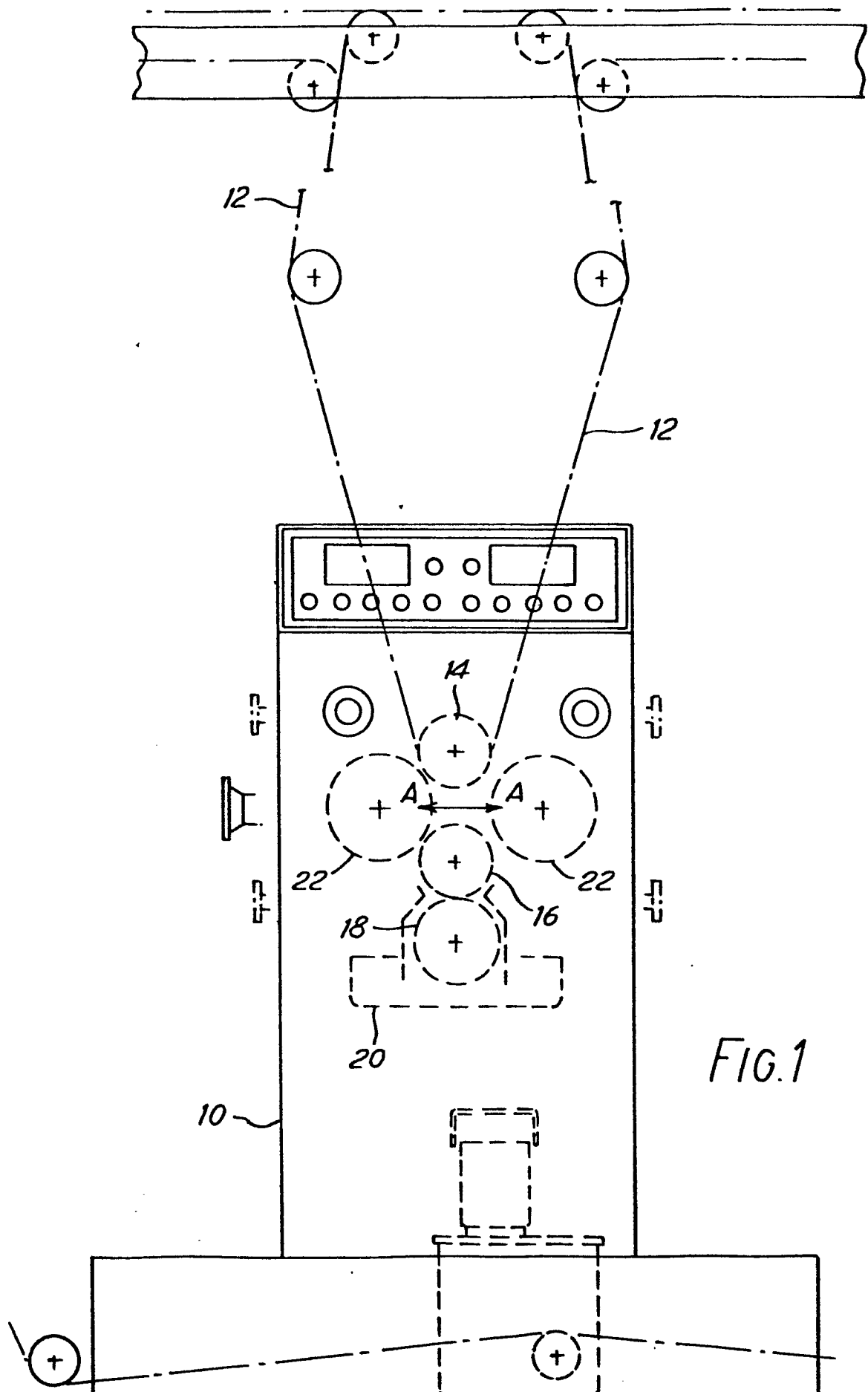
1 to be mounted on fixed centres, and to have the impression roller 14 and inking system 16,18,20 movable in the direction of arrow A-A, so as to changeover from one printing cylinder to the other. It will also be apparent
5 that other mechanisms can be provided to supplement the apparatus described. In particular, a number of safety interlocks may be provided to prevent abuse of the apparatus. One interlock may provide that when the dog clutch 60 is engaged it is not possible to operate the
10 pneumatic cylinder 52 to bring the clutch plate 50 against the stop plate 72 to brake the printing cylinder. A second interlock may prevent the print cylinder 22 being thrown into its operative printing position unless the dog clutch 60 is engaged. A further interlock may provide that the
15 dog clutch 60 cannot be engaged until the clutch plates 46, 50 have been engaged for sufficient time to bring the printing cylinder up to just under its full operating speed.

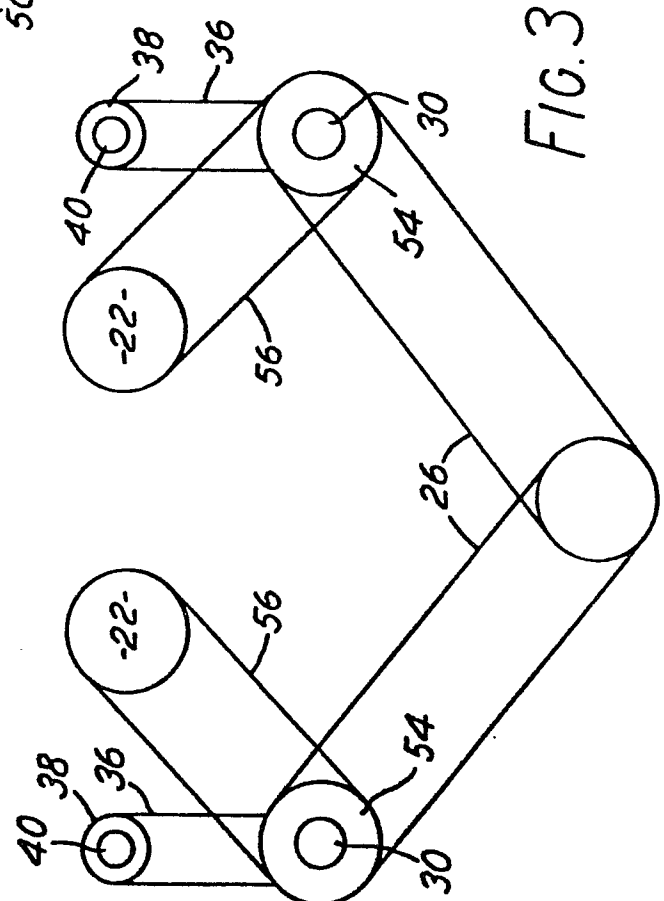
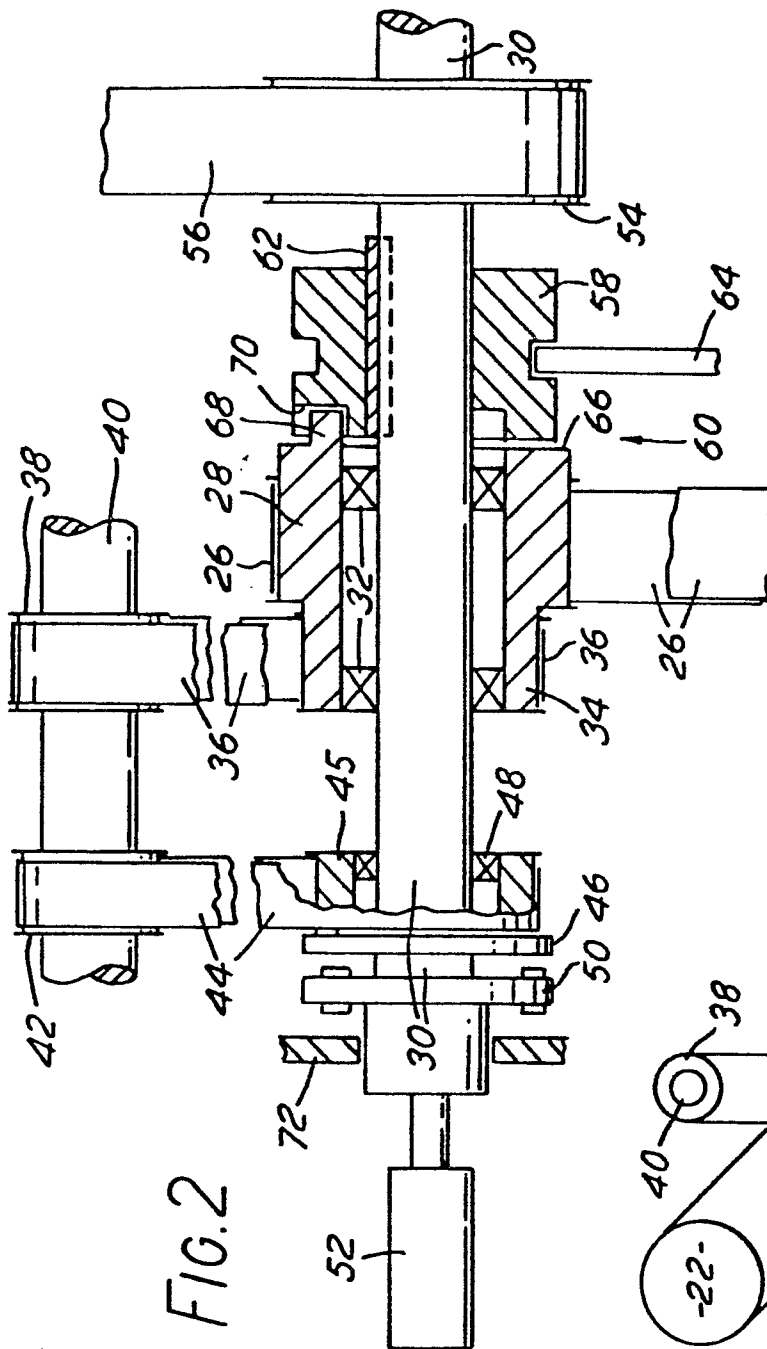
CLAIMS:

1. A printing machine having a main drive (24) for transporting matter to be printed through the machine, and
5 two printing cylinders (22) which are alternatively movable relative to the matter (12) to be printed into and out of operative printing positions, characterised in that the two cylinders (22) are each drivable from the main drive (24), each cylinder being provided with means for
10 engaging it with and disengaging it from the main drive when it is in the inoperative position, said means comprising a dog clutch (68,70), which is provided with only one tooth so as to fix the register between the main drive and the cylinder.
- 15 2. A printing machine according to claim 1 wherein there is an alternative drive (34,36,38,40,42,44,46) for the cylinder (22) derived from the main drive which can be used to speed up the cylinder to a speed slightly slower
20 than its full operating speed before engaging the dog clutch.
3. A printing machine according to claim 1 or claim 2 wherein each printing cylinder is in contact with a common
25 inking roller (16) when it is in its operative position.
4. A printing machine according to claim 3 wherein there is a common impression roller (14) for the two printing cylinders, the two printing cylinders (22) being
30 on opposite sides of a line between the impression roller (14) and the inking roller (16).
5. A printing machine having two printing cylinders (22) which are alternatively movable relative to matter (12) to
35 be printed into and out of operative printing positions,

characterised in that each printing cylinder is in contact with a common inking roller (16) when it is in its operative position.

- 5 6. A printing machine according to claim 5 wherein there is a common impression roller (14) for the two printing cylinders, the two printing cylinders (22) being on opposite sides of a line between the impression roller (14) and the inking roller (16).







European Patent
Office

EUROPEAN SEARCH REPORT

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Application number

EP 80 30 3333

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 2 268 191</u> (GOSS) * Complete description * --	1,2	B 41 F 13/00
	<u>GB - A - 386 170</u> (FOSTER) * Complete description * --	1	
	<u>US - A - 2 051 573</u> (HOE) * Complete description * -----	1,4-6	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3) B 41 F
			CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
☒ The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search		Date of completion of the search	Examiner
The Hague		09-01-1981	LONCKE