United States Patent

Stapleford

[15] **3,661,079**

[45] **May 9, 1972**

[54] ROTARY OFFSET PRINTER WITH DAMPING ROLLER SELECTIVELY ENGAGEABLE WITH PRINT CYLINDER OR BLANKET CYLINDER

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[22] Filed: **Dec. 23, 1968**

[21] Appl. No.: **788,985**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 661,901, Aug. 21, 1967, abandoned.

[30] **Foreign Application Priority Data**

Sept. 3, 1966 Great Britain 39,493/68

[52] **U.S. Cl.** **101/142,** 101/148, 101/179, 101/220

[51] **Int. Cl.** **B41f 7/04,** B41f 7/40

[58] **Field of Search** 101/137–139, 142–144, 101/147, 148, 177–179

[56] **References Cited**

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Primary Examiner—J. Reed Fisher

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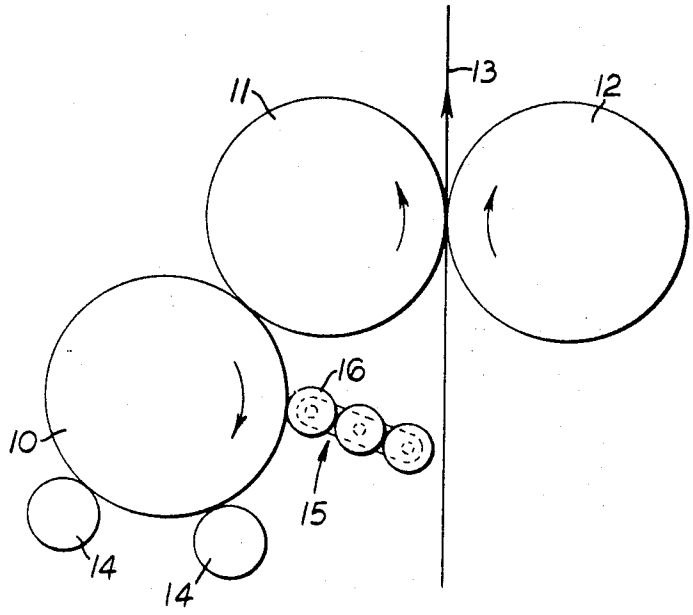
[57] **ABSTRACT**

A reversible rotary web offset printing unit wherein the damping means has alternative contact with the printing cylinder after the blanket cylinder and before the inking means, and with the blanket cylinder after the web and before the printing cylinder in forward and reverse running respectively.

4 Claims, 6 Drawing Figures



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SHEET 1 OF 3

Fig. 1.

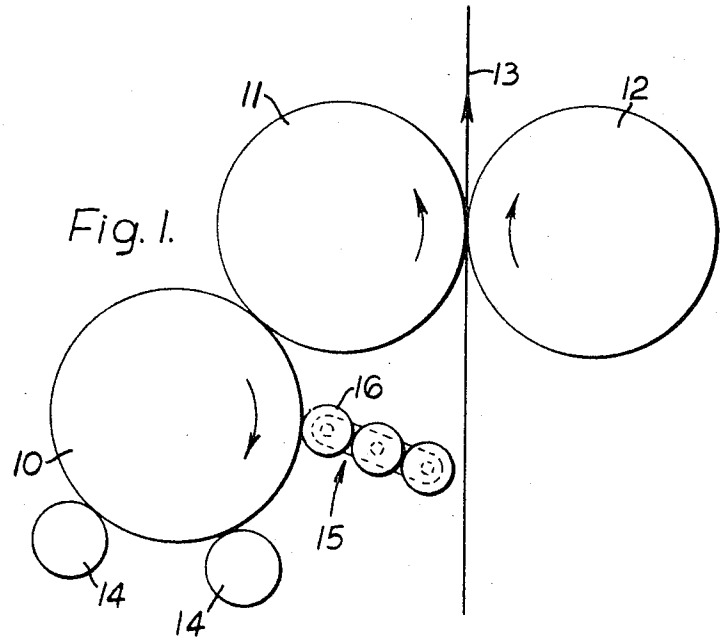
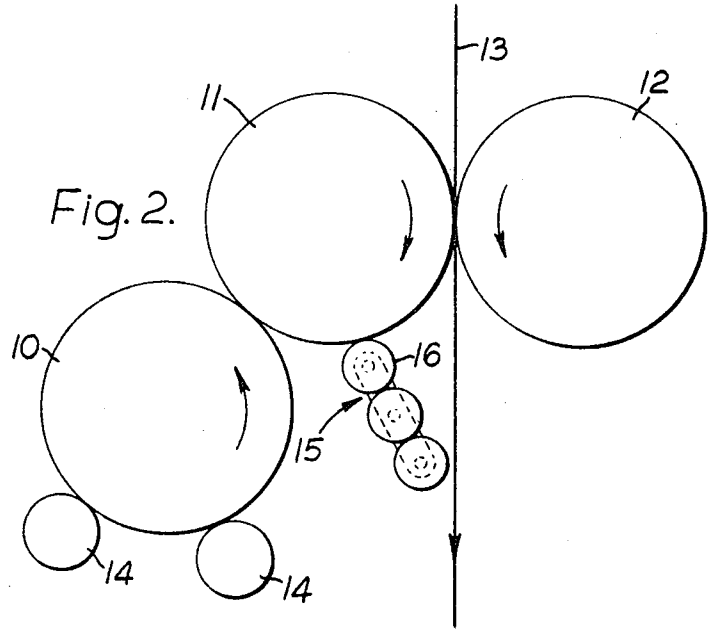


Fig. 2.



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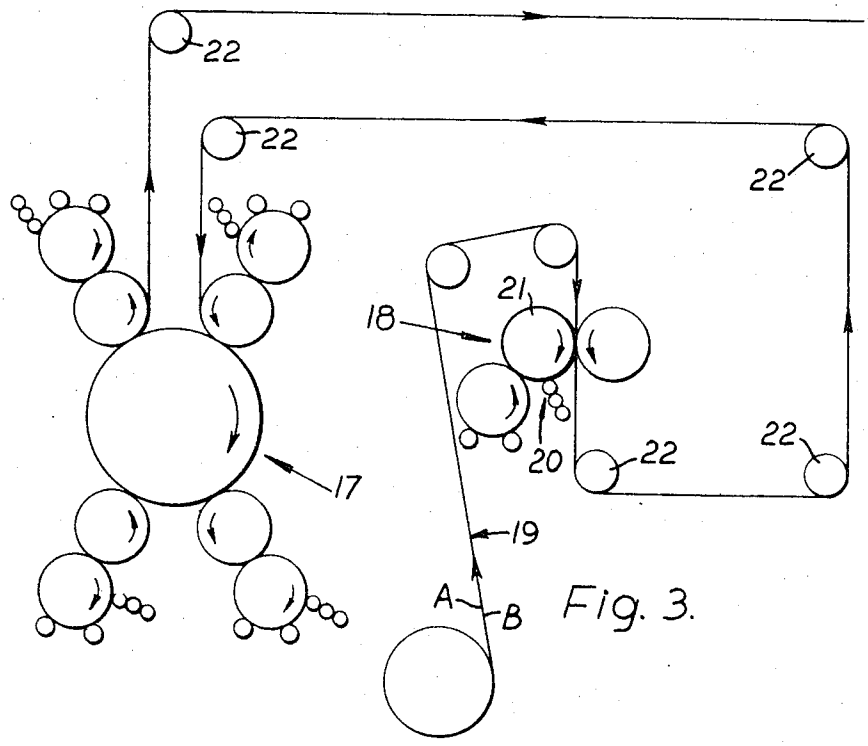

Fig. 3.

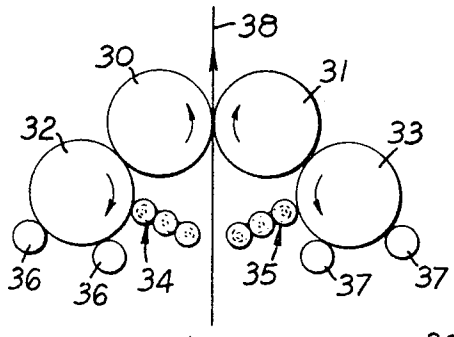

Fig. 4.

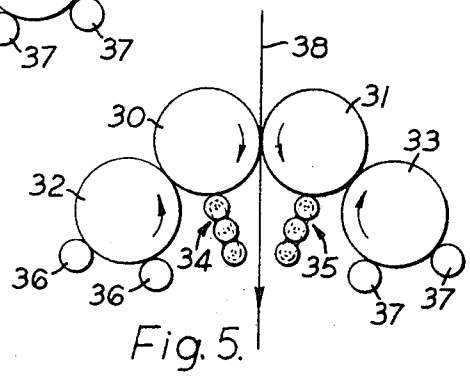

Fig. 5.

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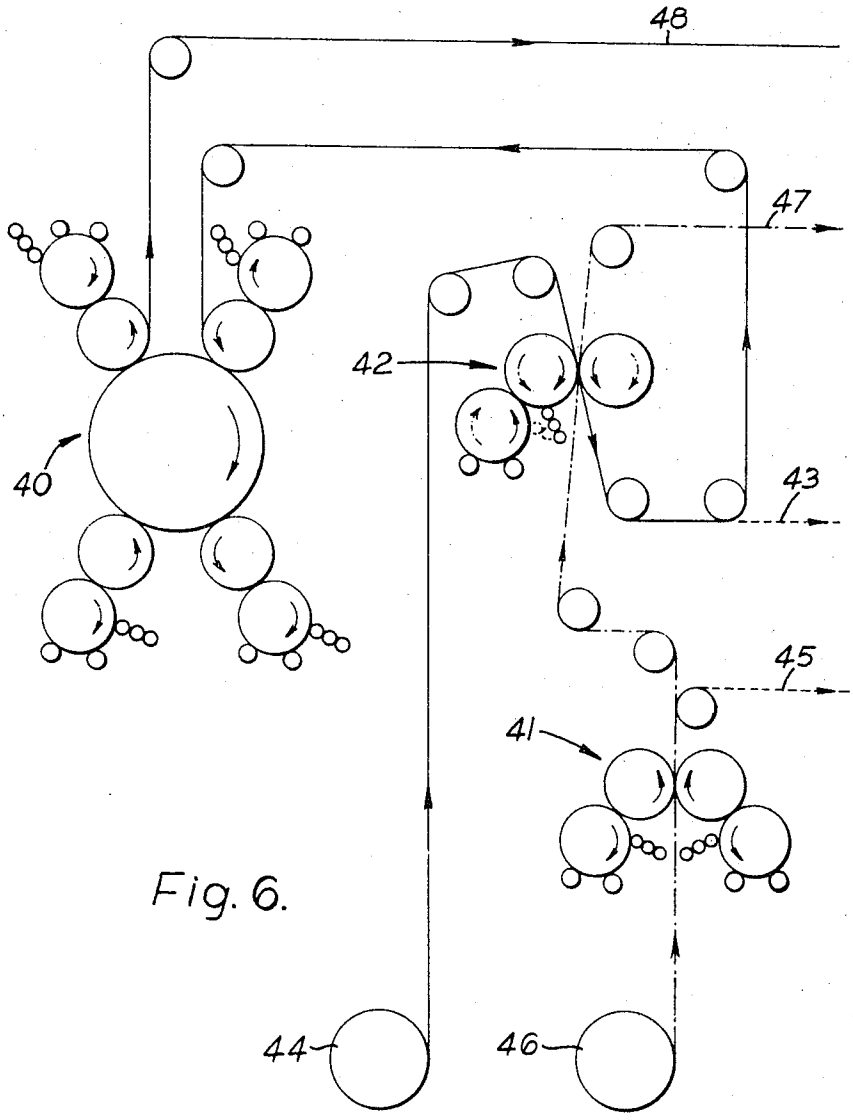

Fig. 6.

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ROTARY OFFSET PRINTER WITH DAMPING ROLLER SELECTIVELY ENGAGEABLE WITH PRINT CYLINDER OR BLANKET CYLINDER

This application is a continuation-in-part of Ser. No. 661,901 filed Aug. 21, 1967, now abandoned.

This invention relates to improvements in rotary web offset printing units.

A simple conventional rotary web offset printing unit comprises separate damping and inking rollers which directly transfer damping solution and ink respectively to a printing cylinder, which in turn transfers an ink image to an offset cylinder, otherwise known as a blanket cylinder, and the latter transfers the ink image to a web of material passing through a "nip" between the blanket cylinder and an impression cylinder. In this process the blanket cylinder, which is usually rubber covered, acts merely as a carrier, and when clean and dry this surface is normally of neutral character generally receptive to both ink and damping solution in the same measure. More complex printing units may comprise several printing and/or blanket cylinders with or without an impression cylinder.

To avoid smears in the printed image on the web due to the damping system being seriously contaminated by ink, it is necessary for a particular surface area of the printing cylinder firstly to receive damping solution and then ink before transfer of the ink image to the blanket cylinder. Hence, in known printing units the direction of movement of a web through a printing unit cannot be reversed by simple reversal of the direction of rotation of the several cylinders since this would entail ink being applied to the printing cylinder prior to the damping solution with resultant probability of contamination of the damping solution with ink.

In the lithographic process a printing plate after previous wetting, accepts ink readily on image areas and rejects ink on non-image areas. It is the object of this invention to utilize the offset or blanket cylinder so that it functions in a similar way mechanically to that of the lithographic plate, namely to acquire ink receptive and ink repellant characteristics in the pattern of the image, and thereby to provide a printing unit which is reversible in operation.

In accordance with this invention, a reversible rotary web offset printing unit comprises at least one printing cylinder, at least one blanket cylinder having direct peripheral engagement with the printing cylinder, inking means for applying ink to the printing cylinder, and damping means operative to apply damping solution to the printing cylinder prior to the application of ink, characterized in that the damping means is movable between a first position of direct engagement with the printing cylinder in a first direction of running of the cylinders and a second position of engagement with the blanket cylinder subsequent to contact of the latter with the web and prior to contact of the blanket cylinder with the printing cylinder in a reverse direction of running of the unit.

Typical embodiments of the invention are described, by way of example only, with reference to the accompanying schematic drawings wherein:

FIGS. **1** and **2** illustrates a simple reversible rotary web offset single color printing unit in its alternative running conditions,

FIG. **3** illustrates a unit of the type shown in FIG. **2** used in series with a known four color printing unit,

FIGS. **4** and **5** illustrate a perfecting type of reversible web offset printing unit according to the invention, and

FIG. **6** illustrates a series combination of each of the units shown in FIGS. **1** to **5**.

Referring initially to FIGS. **1** and **2** the printing unit comprises a printing cylinder **10**, a blanket or offset cylinder **11** directly engaging the printing cylinder and an impression cylinder **12**, with the latter indirectly engaged with the blanket cylinder through a web **13**. The cylinders are driven in synchronism in known manner but according to this invention this drive is reversible. A plurality of inking rollers **14** engage with the printing cylinder **10**, and a damping roller assembly **15** has a terminal roller **16** which, during normal running of the printing unit as shown in FIG. **1**, has engagement with the printing cylinder so that any point on the surface of the printing cylinder **10**, after engagement with the rubber surfaced blanket cylinder **11**, engages firstly with the terminal damping roller **16** and then with the inking rollers **14**. Hence, any part of the printing cylinder surface will receive damping solution from the damping roller, then ink from the inking roller prior to transfer of the ink image first to the blanket cylinder and then to the web passing through the nip between the blanket cylinder and the impression cylinder.

The damping roller assembly **15** is mounted so as to be pivotable between alternative engagement of the terminal damping roller **16** with the printing cylinder **10** as shown in FIG. **1**, and also with the blanket cylinder **11** between the angularly spaced zones of contact of the latter firstly with the web and secondly with the printing cylinder, the latter mode of engagement being adopted when the rotational directions of the three cylinders are reversed as shown in FIG. **2**. In an intermediate or "neutral" position of the damping roller assembly its terminal roller **16** lies out of contact with both the printing cylinder **10** and the blanket cylinder **11**. Any suitable conventional structure may be provided for mounting assembly **15** for selective pivotal displacement between the positions described above, for example by means of a fluid powered ram or screw jack actuated cradle supporting said assembly.

OPERATION

Preparatory to "forward" printing the printing and blanket cylinders are made clean and dry and the apparatus is otherwise prepared in conventional manner prior to running with the parts disposed and operating in the manner illustrated in FIG. **1**.

To print in a "reverse" direction the following sequence of steps is adopted. Firstly the damping roller is positioned for contact with the printing cylinder **10** (i.e., as shown in FIG. **1**) to damp the latter cylinder while cylinders are rotated in the direction appropriate to "reverse" printing as shown in FIG. **2**. Next the damping roller **16** is lifted out of contact with printing cylinder **10** into the "neutral" mid-position between the two extreme positions of its operation (which are the position in contact with the plate cylinder and the position in contact with the blanket cylinder shown in FIGS. **1** and **2** respectively) and the inking rollers **14** are brought into contact with the printing cylinder to ink up the plates of the latter. Finally the printing cylinder is brought into contact with the blanket cylinder and the blanket cylinder into contact with the web **12** on the impression cylinder **2**, all revolving at the same peripheral speed, followed by the damping roller **16** being brought into contact with the blanket cylinder after one or two revolutions of the printing cylinder to assume the conditions shown in FIG. **2**.

During the first revolution of the printing cylinder, when "on impression," an inked image is transferred from the printing plate to the blanket cylinder surface. Through the normal process of ink "splitting," a layer of ink is established on the surface of the blanket. Due to the tacky nature of ink it is bonded to the surface with sufficient force to give retention of a proportionately smaller layer of ink after the impression of the image to the web. This is sufficient to form a base receptive to further supplies of ink to the image areas in the subsequent contact with the plate, even in the presence of the damping solution.

The theory underlying the above process is as follows:

After the initial revolution of the blanket cylinder "on impression," the damping roller **16** applies a damping solution to both image and non-image areas on the former. As previously described, the bond of ink residue is so firm that it is not destroyed mechanically by the brief contact with the damping roller rotating at the same peripheral speed. Chemically, the ink residue is of oily nature therefore the damping solution collects in small droplets on the inked surface, and does not

wash off, or wet it in the same sense as it wets the non-image areas of the blanket. The latter areas receive the moisture readily and carry it in a thin layer.

In the nip between the blanket and plate cylinders, the previously inked areas of the blanket meet freshly inked areas of the plate. The areas meet under pressure for the period of "nip" and when they part at the end of the nip, splitting of ink occurs in the normal way. Such droplets of damping solution that are trapped between the two inked areas which meet in the nip, are broken up by the contact pressure and dispersed in the ink in still smaller droplets, or film. This phenomenon is well known and present in the normal lithographic process. The dispersion of emulsified damping solution in the ink not only does not affect adversely its splitting and transfer properties, but may even assist such splitting and transfer. It is also found that even a relatively large proportion of water dispersed in ink has very small effect on reducing the ink density in print.

The fresh layer of damping solution on the non-image areas of blanket meets in the nip the water receptive surface of the plate. On leaving the nip the damping solution is attracted chemically to this latter surface, rather than to the blanket surface which is chemically neutral, so that a greater proportion of damping solution is retained by the plate. This forms an adequate layer which repels ink when the plate comes into contact with the inking rollers.

Thus the inked image being printed is not destroyed by the simultaneous transfer in opposite directions of ink and damping solution in reverse running. Further, the mechanical process of transfer of these media in the nip does not destroy their chemical properties and the ink and damping solution continue to exhibit their natural tendencies on entering, during and on leaving the nip so that the necessary conditions for the lithographic process are maintained.

One example of the utilization of the above described reversible printing unit is for printing on one side of a web in one color and on the reverse side of the web in four colors as illustrated in FIG. **3**. To print in four colors on one web side, the web is passed via guide rollers **22** through a multi-color printing unit **17**, such as that disclosed in British Pat. specification No. 872849, after the reversible printing unit **18** has printed in a single color on the reverse side **13** of the web **19**. To print in this manner the web must, for practical reasons, pass through one printing unit in the reverse of the normal direction, which is accomplished by the reverse running of the single color printing unit **18** with its terminal damping roller **20** in direct engagement with the blanket cylinder **21**.

As illustrated in FIGS. **4** and **5**, the invention is also applicable to so called "perfecting" printing units which simultaneously print a single color on each side of a web. In this unit, an independent impression cylinder is omitted and a nip is provided between a pair of blanket cylinders **30**, **31** each associated with a respective printing cylinder **32** and **33** and respective damping and inking rollers **34**, **35** and **36**, **37**. Each blanket cylinder **30**, **31** serves as an impression cylinder for the blanket cylinder printing on the opposite side of the web **38**. Such a unit is made reversible by mounting both damping rollers **34** and **35** so that they are movable from engagement with their respective printing cylinders **32** and **33** as shown in FIG. **4** to engagement with their respective blanket cylinders **30**, **31** as shown in FIG. **5**.

In the further example of the use of the invention shown in FIG. **6** a printing press comprises three printing units, namely a multi-color unit **40**, a perfecting unit **41**, and a simple reversible unit **42**. The following variations in printing can for example be obtained with such a press.

1. A web **43** passing from the reel stand **44** only through the reversible unit **42** will be printed in one color on one side only according to the direction of running of the unit.

2. A web **25** passing from the reel stand **46** only through the perfecting unit **41** will be printed in one color on each side.

3. A web **47** passing through both the perfecting unit **41** and the reversible unit **42** will be printed in one color on a first side and two colors on the second side with the unit **42** operating normally, and

4. A web **48** passing from reel stand **44** through both the multi-color unit **40** and the reversible unit **42**, with the latter operating in reverse, will be printed in four colors on one side and in only one color on the other side.

The construction of a suitable mounting for the damping rolls to permit their alternative engagement with the printing cylinder and the blanket cylinder is within the skill of persons versed in the art of printing machine manufacture and is accordingly not described in detail, but it is envisaged that the mounting can for example comprise a swinging frame controlled by adjusting screws or fluid powered piston and cylinder units.

I claim:

1. A reversible rotary web offset printing unit comprising at least one printing cylinder, at least one blanket cylinder having direct peripheral engagement with the printing cylinder, inking means for applying ink to the printing cylinder, and damping means operative to apply damping solution to the printing cylinder prior to the application of ink characterized in that the damping means (**15**) is movable between a first position of direct engagement with the printing cylinder (**10**) in a first direction of running of the cylinders and a second position of engagement with a zone of the blanket cylinder (**11**) subsequent to contact of the latter with the web (**13**) and prior to contact of the blanket cylinder (**11**) with printing cylinder (**10**) in a reverse direction of running of the unit, said damping means (**15**) comprising at least one roller (**16**) which is alternatively engageable with the printing cylinder and the blanket cylinder.

2. A printing unit according to claim **1** characterized by a pair of blanket and printing cylinders (**30**,**32** and **31**,**33**)wherein the blanket cylinders establish a printing nip therebetween and each engaged pair of printing and blanket cylinders is engageable by separate damping means.

3. A printing unit according to claim **1** comprising further an impression cylinder (**12**) rotating oppositely to said blanket cylinder to define a web printing pass therebetween.

4. A printing unit according to claim **1**, said damping means being a single device mounted for pivotal movement between said first and second positions.

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