July 12, 1960 C. ALLER 2,944,482

ROTARY PRINTING PRESS FOR OFFSET PRINTING WITH THREE OR MORE COLOURS

Filed Feb. 4, 1958 3 Sheets-Sheet 1

Fig. 1.

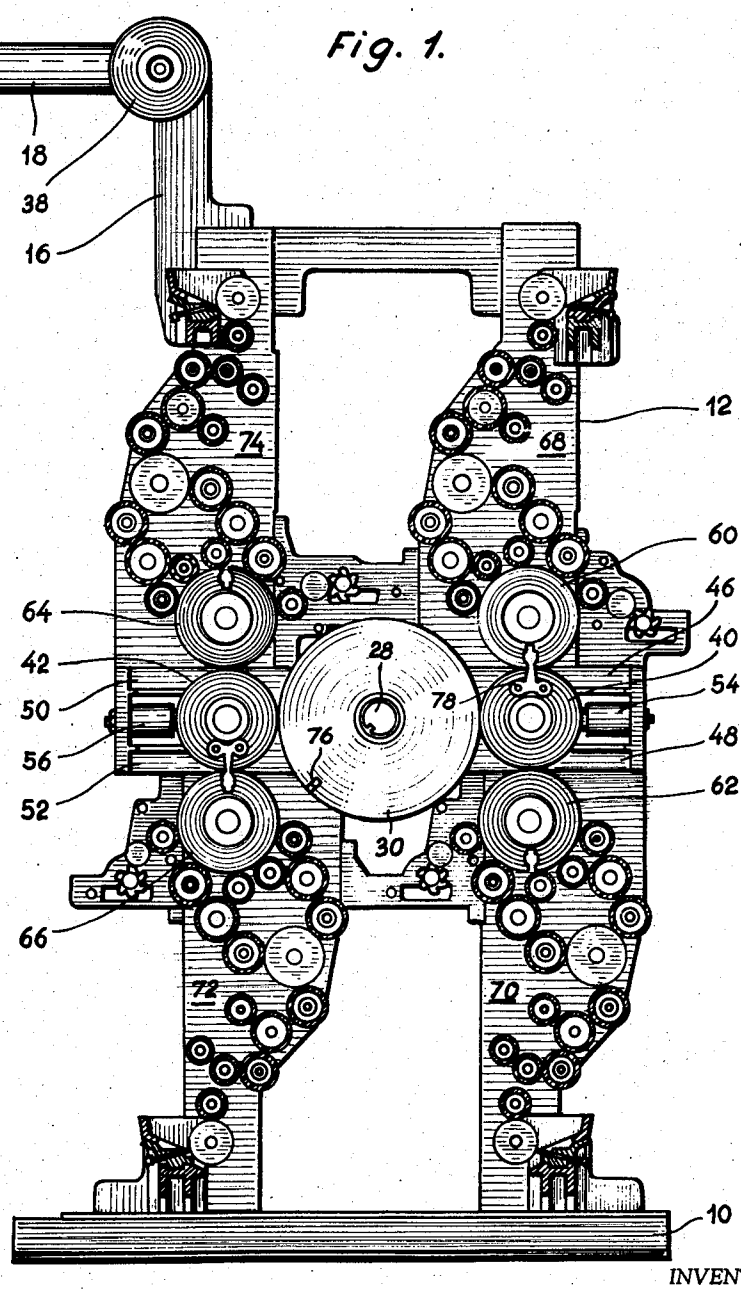

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Fig. 2.

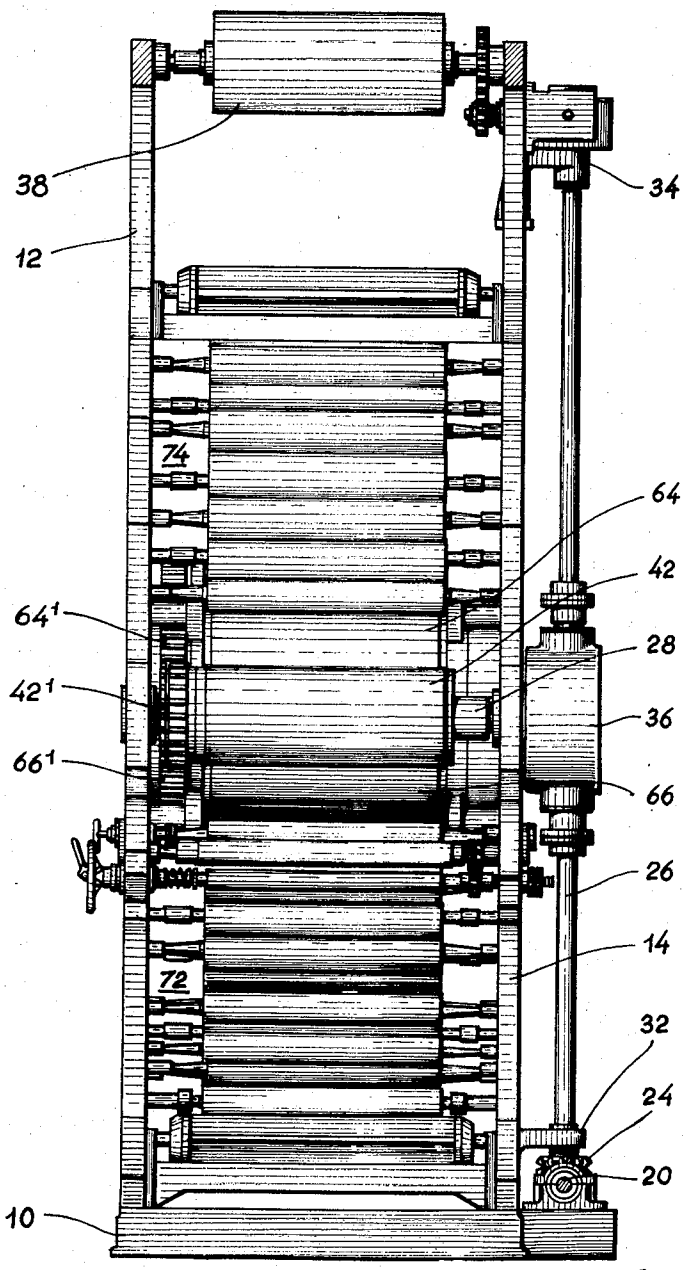

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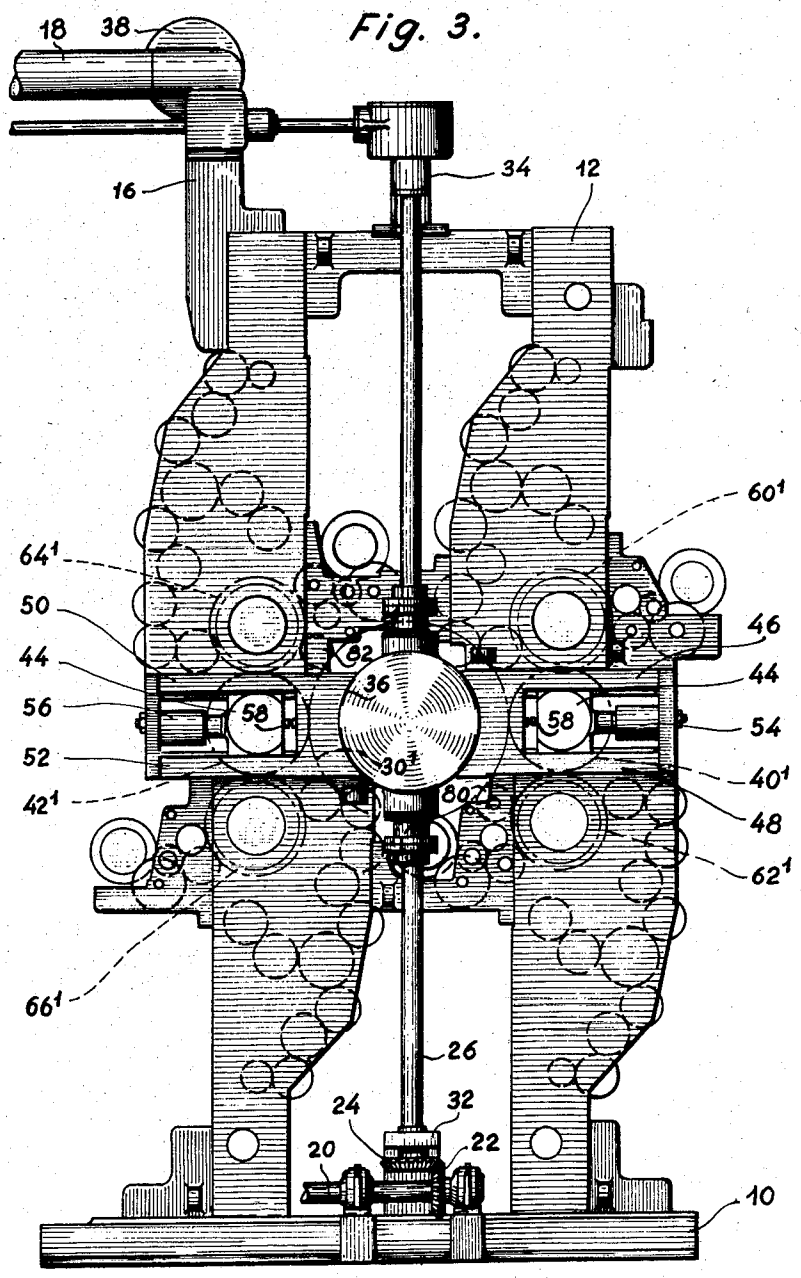
Fig. 3.



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United States Patent Office 2,944,482 Patented July 12, 1960

2,944,482

ROTARY PRINTING PRESS FOR OFFSET PRINTING WITH THREE OR MORE COLOURS

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Filed Feb. 4, 1958, Ser. No. 713,219

Claims priority, application Denmark Feb. 8, 1957

5 Claims. (Cl. 101—177)

The invention relates to a rotary printing press designed for offset printing in three or more colours, and which contains cylindrical formes, blanket cylinders, and an impression cylinder.

Generally the known rotary printing presses of this kind are so arranged that each of the cylindrical formes receives ink from an inking device and deposits the said ink on a cooperating blanket cylinder, which again transfers the printing ink to a web, which is laid around and advanced by the impression cylinder. A commonly used press for printing in four colours is provided with four blanket cylinders distributed at 90° angular distance along the surface of the impression cylinder. Each of said blanket cylinders transfers its ink to the web. For practical reasons the diameter of the impression cylinder is four times the diameter of the blanket cylinders, which have the same diameter as the cylindrical formes. A motor drives the impression cylinder, which by means of a gearing again drives the blanket cylinders, each of which by means of a gearing again drives the respective cylindrical forme.

Such known rotary printing presses are very expensive and bulky. Each necessary roller or cylinder requires its space and contributes to the total price. As already mentioned, in a press for four colours the impression cylinder is very large, and the placing of the four blanket cylinders with the cooperating formes involves such arrangement of the cooperating inking devices that the length and height of the press become very considerable.

Other known printing presses are so constructed that one blanket cylinder is in contact with and receives printing ink from two cylindrical formes.

The main object of the present invention is to provide a rotary printing press, which requires less space and is less expensive to manufacture than corresponding hitherto known presses. Other objects of the invention will appear from the following description.

According to the present invention a rotary printing press for offset printing in three or more colours, comprising cylindrical printing formes, blanket cylinders and an impression cylinder, at least one blanket cylinder being in contact with two cylindrical printing formes, is provided with two blanket cylinders positioned diametrically opposite to one another in relation to the impression cylinder. When each of the said blanket cylinders is in contact with two formes, the press may consequently be used for printing with four colours.

By this design the appertaining four inking devices can be placed substantially over and beneath the corresponding blanket cylinders and closer to a horizontal plane through the axis of the impression cylinder than in the case of the known rotary printing presses for offset printing in four colours, and the inking devices can even advantageously be arranged closer to the vertical central plane of the machine, so that it will be possible further to reduce the height and width of the press as compared with similar known rotary printing presses.

The maximum space economy is obtained when two

cylindrical formes, which are in contact with the same blanket cylinder, are placed diametrically opposite to one another in relation to the said blanket cylinder.

This embodiment can furthermore be so arranged that a plane through the axes of the two formes is substantially perpendicular to a plane through the axes of the blanket cylinder and the impression cylinder. In such construction the blanket cylinder can be removed radially away from the impression cylinder without disengaging the gear wheel of the blanket cylinder from those of the cooperating formes, so that the proper mutual angular position between the said cylinders is safely maintained. In order that the blanket cylinder can be removed from and approached to the impression cylinder in a suitable manner, without the necessity arising for a displacement of the formes, in the case of a rotary printing press designed as aforesaid, wherein the shaft of the blanket cylinder is mounted in guides, which permit the blanket cylinder to be removed from the impression cylinder by a parallel displacement, the press can be so arranged that the direction of the said parallel displacement of the blanket cylinder is perpendicular to the said plane through the axes of the two formes.

The rotary printing press can be provided with a hydraulic mechanism for parallel displacement of the blanket cylinder and with adjustable stops for restricting the movement of the blanket cylinder towards the impression cylinder. It is thereby obtained that by means of the hydraulic mechanism a predetermined working pressure between the blanket cylinder and the impression cylinder is always automatically obtained, when the blanket cylinder has been removed from and is again being restored to its working position, abutting against the impression cylinder. This movement of the blanket cylinder to and from working position has to be effected fairly often, because when the cylinders are not rotating the blanket cannot stand the pressure of the neighbouring cylinders for long without permanent deformation.

In the said different cylinders are provided longitudinal grooves, wherein the edges of the thin plate-shaped covers on the different cylinders are bent and fastened. During the rotation of the cylinders the said longitudinal grooves of two cooperating cylinders must always meet so as not to spoil the printing, which is transferred from cylinder to cylinder or from cylinder to the paper. It is therefore necessary that the blanket cylinder, when it has been removed from the impression cylinder and is again brought into contact with same, establishes an engagement between its gear wheel and that of the impression cylinder, which ensures a predetermined relative angular position of the two cylinders.

In a rotary printing press of the aforesaid kind, where a gear wheel in fixed connection with the impression cylinder drives a gear wheel in fixed connection with the blanket cylinder, and where a gear wheel in fixed connection with the blanket cylinder drives gear wheels, each of which is in fixed connection with its respective cylindrical forme, the said predetermined relative angular position between the two cylinders can be achieved by means of an extra gear wheel, which engages one of the said gear wheels in fixed connection with one forme as well as the impression cylinder gear wheel driving the blanket cylinder. The said extra gear wheel is placed on a shaft, which is so mounted in guides that it can be parallelly displaced a short distance between fixed stops in a direction at right angles to a plane through the axis of the impression cylinder and the axis of the said cylindrical forme. During the operation of the rotary printing press this extra gear wheel will not serve to transmit driving power from the impression cylinder to the cylindrical forme concerned, because under the influence of increased tooth loads, if any, it will merely be slightly displaced to a posi-

tion, wherein the tooth loads are minimal. On the other hand the extra gear wheel will always engage the said two other gear wheels and with sufficient precision ensure a predetermined relative angular position of said wheels and consequently also of the blanket cylinder gear wheel, which in spite of the displacements of the blanket cylinder from and to the working position will always engage the gear wheels, which are in fixed connection with the two cylindrical formes.

The invention will be explained in more detail in the following, reference being had to the drawings, which show an embodiment of a rotary printing press according to the invention for offset printing in four colours, and wherein:

Fig. 1 shows schematically the press as seen in axial direction for the various cylinders and rollers, one side of the frame having been cut away,

Fig. 2 is an end view of the same press, and

Fig. 3 is a representation similar to that of Fig. 1, however, instead of rollers and cylinders the pitch circles of the various gear wheels of the press having been indicated in dot-and-dash lines.

The frame of the rotary printing press mainly consists of a base frame **10** and two vertically disposed side frames **12** and **14**. At the top the side frames are connected by frame parts **16** and **18**, which serve the connection with another corresponding rotary printing press, not shown, in order that a web which passes through both presses continuously can be printed on either side in the same operation.

The rotary printing press is driven from a motor, not shown, through a main shaft **20**, which by means of bevel gears **22** and **24** drives a vertical shaft **26**, guided in bearings **32** and **34** which are in fixed connection with the side frame **14**. By means of gear wheels, not shown, in a gear box **36** the vertical shaft **26** drives a horizontal shaft **28**, which is mounted in bearings in the two side frames **12** and **14**, and on which is attached an impression cylinder **30**. The web which is to be provided with printing is passed around the greater part of the circumference of the impression cylinder, being kept clear of the inking devices and other cylinders and rollers of the press by means of guiding rollers. The web and its guiding rollers have not been shown, as they are quite usual and do not constitute part of the present invention, except that on the top of the frame a paper guilding cylinder **38** has been shown, which by means of suitable gearings is driven from the vertical shaft **26**.

At the right and left sides of the impression cylinder **30** a rubber blanket cylinder **40** and **42**, respectively, has been mounted, Fig. 1, said cylinders being mounted in bearings **44**, which can be displaced in guides **46**, **48** and **50**, **52**, respectively. The bearings can be displaced by means of a hydraulic mechanism with hydraulic cylinders **54** and **56**, so that the rubber blanket cylinders as desired can be removed from the impression cylinder **30** or displaced into abutment against same. In order always to ensure a predetermined pressure between the impression cylinder and the rubber blanket cylinders, when they are in working position, there are provided in conjunction with the guides adjustable stops **58**, Fig. 3, against which the bearings **44** rest, when the rubber blanket cylinders abut against the impression cylinder at a predetermined pressure.

In Fig. 1, where the bubber blanket cylinders **40** and **42** have been shown in working position in contact with the impression cylinder **30**, the numerals **60**, **62**, **64**, and **66** denote four cylindrical formes, of which the formes **60** and **62** are in contact with the rubber blanket cylinder **40**, each transferring its respective colour thereto, whereas the formes **64** and **66** are in contact with the rubber blanket cylinder **42** and transfer two other different colours thereto. The inks concerned are applied to the cylindrical formes from four inking devices, the figures **68**, **70**, **72**, and **74**, respectively, referring each to an inking unit. The units **68** and **74** are arranged above the respective formes **60** and **64** and the units **70** and **72** are arranged beneath the respective formes **62** and **66**. The inking devices are of usual known construction, and therefore no further description is needed.

In Fig. 3 the pitch circles of the different gear wheels, which belong to the press, have been shown in dot-and dash line. The pitch circles have the same reference numbers as the respective gear wheels, some of which, only, have been shown in Fig. 2. By means of a gear wheel **39'**, which is in fixed connection with the impression cylinder **30**, the said cylinder drives two gear wheels **40'** and **42'**, which are in fixed connection with the rubber blanket cylinders **40** and **42**, respectively. The gear wheel **40'** drives two gear wheels **60'** and **62'**, which are in fixed connection with the two cylindrical formes **60** and **62**, respectively, whereas the gear wheel **42'** drives two gear wheels **64'** and **66'**, which are in fixed connection with the two cylindrical formes **64** and **66**, respectively. The impression cylinder **30** and the four cylindrical formes **60**, **62**, **64**, and **66** have bearings, which are immovable in relation to the side frames **12** and **14**, and by means of special gear wheels the formes in known manner drive the rollers of the four inking devices **68**, **70**, **72**, and **74**. As the axes of the two cylindrical formes **60** and **62** are disposed in a vertical plane through the axis for the rubber blanket cylinder **40**, it is possible to maintain the toothed engagement between the gear wheels **60'**, **62'**, and **40'**, respectively, appertaining to said cylinders, when the rubber blanket cylinder **40**, Fig. 1, by a displacement of its bearings **44**, Fig. 3, to the right in the guide **46**, **48** is removed so far from the impression cylinder **30** that the toothed engagement between the cooperating gear wheels **40'** and **30'** comes to an end. Hereby the rubber blanket cylinder **40** is removed so far from the cylindrical formes that it ceases to be in contact with same and therefore will not be permanently deformed by these formes.

When by means of the hydraulic cylinder **54** the rubber blanket cylinder **40** is again to be brought into contact with the impression cylinder **30** and the two cylindrical formes **60** and **62**, it is necessary when the gear wheels **40'** and **30'** engage that exactly the same relative angular position is obtained between the impression cylinder and the rubber blanket cylinder as that which existed before the rubber blanket cylinder was removed from the impression cylinder, and which is a predetermined relative angular position, in order that it can be ensured that a fastening groove **76** in the impression cylinder **30**, Fig. 1, will always meet a fastening groove **78** in the rubber blanket cylinder **40**, when the press is in operation. The said fastening grooves in known manner serve to receive and fasten adjoining edges of the covers on the two cylinders.

In order to ensure that the rubber blanket cylinder cannot be rotated on its axis independently of the impression cylinder, when as mentioned in the foregoing the said cylinders have been removed from one another, a small gear wheel **80** has been inserted between the gear wheel **62'** of the cylindrical forme **62** and the gear wheel **30'** of the impression cylinder, so as to be in engagement with both of the said gear wheels. As the gear wheel **40'** of the rubber blanket cylinder under all conditions engages the gear wheels of the formes, and as the gear wheel **62'** of the forme **62** by means of the small gear wheel **80** is ensured a fixed relative angular position to the gear wheel **30'** of the impression cylinder, the rubber blanket cylinder will consequently also always occupy a predetermined relative angular position in relation to the impression cylinder, when the gear wheels of the said cylinders are made to engage. The small gear wheel **80** is not meant to transmit the driving power from the impression cylinder to the forme **62**, as this driving connection has already been established by means of the gear wheel **40'** of the rubber blanket cylinder. If, nevertheless, the small gear wheel were to take part in

the transmission of power to the gear wheel 62', unduly heavy tooth loads might easily arise owing to this double gear wheel transmission with consequent rapid wearing down of the teeth. In order to prevent that the small gear wheel happens to transmit driving power during the operation of the press, it has been placed on a shaft, which is so mounted in bearings in guides that it can be displaced a short distance between fixed stops in a direction, which is at right angles to a plane through the axis for the impression cylinder 30 and the axis for the cylindrical forme 62. The distance through which the shaft of the small gear wheel can be displaced in the guide is so short that it cannot bring about a wrong relative angular position between the rubber blanket cylinder and the impression cylinder, when the gear wheels of the said cylinders are made to engage one another, but on the other hand the possible displacement of the small gear wheel is large enough to ensure that under normal operation the said small gear wheel cannot transmit driving power on account of the predetermined relative angular positions between all the cylinders 30, 40, 60, and 62, which are ensured by the various appurtenant cooperating gear wheels.

In exactly corresponding manner and for exactly the same purpose a small gear wheel 82 engages the gear wheels 30' and 64' in order to ensure that the rubber blanket cylinder 42 and the impression cylinder 30 will be in a predetermined relative angular position, when this rubber blanket cylinder is moved into abutment against the impression cylinder.

In the embodiment shown, where the axes of a rubber blanket cylinder and the cooperating cylindrical formes are in a vertical plane, which is perpendicular to a horizontal plane through the axes of the rubber blanket cylinders and the impression cylinder, it is to a remarkable degree made possible so to arrange the inking devices that height and width of the rotary printing press according to the invention can be made substantially smaller than height and width, respectively, of corresponding known rotary printing presses. Such a suitable arrangement of the individual rollers of the inking devices has been shown in Fig. 1. Otherwise, the said rollers are of usual design, for which reason the inking devices will not be mentioned in more detail.

While the rotary printing press herein shown and described is designed for offset printing in four colours, a similar press for three colours can be provided by removing one of the cylindrical formes, e.g. 66, and the cooperating inking device 72.

Having thus fully described my invention I claim as new and desire to secure by Letters Patent:

1. A rotary printing press for offset printing, comprising an impression cylinder, at least one blanket cylinder normally in contact with said impression cylinder, two cylindrical formes contacting said blanket cylinder at opposite sides thereof in a plane perpendicular to a plane through the axes of said impression cylinder and said blanket cylinder, a gear wheel fixed to said impression cylinder, a gear wheel fixed to said blanket cylinder and normally intermeshing with the gear wheel of the impression cylinder, gear wheels, each fixed to one of said cylindrical formes and intermeshing with the gear wheel of said blanket cylinder, and an extra gear wheel interposed between the gear wheel of the impression cylinder and the gear wheel of one of the cylindrical formes and in constant intermeshment with both last named gear wheels in order to retain the mutual angular position of said impression cylinder and said blanket cylinder when the latter is moved radially away from said impression cylinder to such extent that the intermeshment between their gear wheels is done away with.

2. A rotary printing press for offset printing according to claim 1, in which the axis of said extra gear wheel is displaceable a short distance in a plane perpendicular to a plane through the axes of the impression cylinder and said one of the cylindrical formes.

3. A rotary printing press for offset printing according to claim 2, in which fixed stops are provided for restricting the displacement of the axis of said extra gear wheel.

4. A rotary printing press for offset printing, comprising an impression cylinder, two blanket cylinders arranged at either side of said impression cylinder, respectively, a pair of cylindrical formes for each blanket cylinder, arranged above and beneath the latter, respectively, and inking means for said cylindrical formes, arranged above the upper formes and beneath the lower formes.

5. A rotary printing press for offset printing in three or more colors, comprising cylindrical forms, blanket cylinders, an impression cylinder and guides for displacement of at least one of said blanket cylinders away from said impression cylinder, two cylindrical forms which are in contact with one blanket cylinder being placed diametrically opposite to one another in relation to said blanket cylinder, two blanket cylinders being positioned diametrically opposite to one another in contact with said impression cylinder, a plane through the axes of said two cylindrical forms being substantially perpendicular to a plane through the axes of said blanket cylinders, said guides for said blanket cylinder being so arranged that said blanket cylinder is displaceable in a direction perpendicular to the plane through the axes of the two cylindrical forms contacting said blanket cylinder.

References Cited in the file of this patent

UNITED STATES PATENTS

942,923	Pancoast	Dec. 14, 1909
1,162,739	Banzett	Dec. 7, 1915
2,118,238	Smith	May 24, 1938
2,267,380	Tyler	Dec. 23, 1941
2,649,734	Ras	Aug. 25, 1953

FOREIGN PATENTS

265,529	Switzerland	Dec. 15, 1949
300,613	Switzerland	Aug. 15, 1954