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(54) WATERMARKING APPARATUS

VORRICHTUNG ZUR HERSTELLUNG EINES WASSERZEICHENS

APPAREIL A FILIGRANER

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FR-A- 2 023 814	GB-A- 2 046 173
GB-A- 2 159 463	US-A- 3 985 927
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Description

This invention relates to a watermarking apparatus. In particular, it relates to an apparatus for watermarking discrete sheets of paper.

Paper on a reel is conventionally watermarked by a chemical process following manufacture. The base paper for chemical watermarking is specially made. In the watermarking process, the chemical impregnates the paper between the fibres and reacts with the moisture in the paper, taking on a solid translucent state giving the watermark effect. At the present time, reels of paper are manufactured on a paper machine which is approximately 1930 mm in width. The reels of paper are slit into widths of 485 mm before being watermarked.

A conventional watermarking apparatus 200 is shown in diagrammatic form in Figure A. The apparatus 200 comprises a duct roller 11, a coater roller 12, an impression cylinder roller 15, a die cylinder roller 16, a duct 13 for holding watermarking chemical 51 and a recycling pump 14 for pumping the chemical 51 into the duct 13. Dies 50 are mounted on the die cylinder roller 16. In the watermarking procedure, the chemical 51 is transferred to each die 50 from the duct 13 via the duct roller 11 and the coater roller 12. Paper is fed from a reel 60 to a take-up reel 70, passing between the impression cylinder roller 15 and the die cylinder roller 16, the rollers 15 and 16 being in contact with one another along their length. As the paper passes between the rollers 15 and 16, it is squeezed between each coated die 50 and the impression cylinder roller 16 so that the chemical impregnates the paper to give the desired image.

The duct 13 is made of stainless steel, is approximately 500 mm in width and has a depth of approximately 75 mm. Use of the pump 14 prevents sedimentation of solid particles in the watermarking chemical 51 which would reduce the effectiveness of the translucent image.

The duct roller 11 is made of steel coated with an inert, non-corrosive rubber. It is approximately 500 mm in length and 150 mm in diameter. The coater roller 12 is approximately 500 mm in length and 100 mm in diameter. The coater roller 12 is made of steel, is chrome dipped and has miniature holes on the chrome surface. The duct roller 11 transfers the watermarking chemical 51 to the adjacent coater roller 12, the amount of chemical 51 dispensed being dependent on the squeeze between these two rollers. This in turn is governed by the size of the dies 50 used for watermarking. The die cylinder roller 16 is approximately 500 mm in length and has a circumference of approximately 640 mm. The impression cylinder roller 15 is made of steel and is also approximately 500 mm in length and has a circumference of approximately 640 mm.

The dies 50 are made of a flexible plastics or rubber material and commercially available, and are called photopolymer plates. They are mounted on the die cylinder roller 16 by means of conventional two-sided tape.

One of the disadvantages of the conventional watermarking procedure is that considerable time is involved in positioning the dies on the die cylinder roller. The size of sheet most commonly required to be watermarked is A4 which measures 297 x 210 mm. Accordingly, for each revolution of the die cylinder roller, the equivalent of four A4 sheets may be watermarked on a continuous reel of paper. When one watermark only is required per A4 sheet, four dies must be fixed on the die cylinder roller. This is a very time-consuming and, therefore, a costly procedure which involves accurate measurement of each die to locate the centre point thereof and the positioning of the dies relative to one another and to the paper so that the required watermark is square on each A4 sheet ultimately produced. The positioning of each die on the die cylinder roller takes at least 20 minutes using the conventional watermarking apparatus. In cases where three watermarks are required on each A4 sheet, twelve dies must be positioned on the die cylinder roller so that the time taken for setting up the dies alone is at least 240 minutes.

Another disadvantage of the conventional watermarking procedure is that large batches of the watermarking chemical have to be mixed because of the large size of the duct roller and consequently the duct. However, only a small proportion of the mixed chemical is actually used in each run. Because the mixed chemical is chemically unstable, the unused portion therefore goes to waste.

Following watermarking, each reel of watermarked paper is taken to a sheet cutter to be cut to size 450 x 640 mm. A further disadvantage of the conventional system is the length of time taken in positioning the cutting blades relative to the watermark on each sheet, which requires skilled operators. The sheets must be cut on a single basis as opposed to a general cutter for unwatermarked paper which will cut four reels together, thus involving increased time and costs. Each 450 x 640 mm sheet is subsequently guillotine trimmed to the required size, usually A4, which again requires skilled operators and accurate measurement. As printing of the watermarked sheets is generally required, the sheets must then be dispatched to a print company for printing. It will be appreciated that in the conventional procedure, watermarking always takes place before printing.

Before an end user receives the watermarked A4 or other size sheets, an extremely time-consuming and costly procedure has taken place. The minimum preparation time for watermarking by the conventional procedure is approximately two hours; large batches of watermarking chemical are required, substantial amounts being wasted; a number of dies are required and these are relatively expensive; the watermarked sheets must be cut on a single basis and skilled guillotine trimming of these cut sheets is also required. Because of the high costs involved in the conventional watermarking procedure, a minimum order of about 10,000 A4 sheets is currently required by watermarking

companies as a smaller order would not be cost effective. In Norris U.S. Patent No. 3985927, there is disclosed a method for producing a chemical watermark in which a conventional offset printing press is modified and converted so as to enable the apparatus to watermark paper sheets in a manner similar to conventional offset printing. The thus watermarked sheets must then be printed on another printing apparatus.

The disadvantages of converting an offset printing apparatus to produce watermarked paper are (a) having regard to the corrosiveness of the chemicals used, unless considerable precautions and cleaning techniques were employed, the press would rapidly deteriorate and become inseparable, and (b) the conversion and uses of such a press is relatively expensive which costs are further exacerbated by the need for the paper to be subsequently printed with other indicia using a further printing press. There is thus a need for a watermarking apparatus which is easy to operate and is economical in use even where relatively small orders are concerned.

European Patent Specification No. EP-A-0 234 885 discloses a document security system in which each document is provided with a synthetic watermark and within the perimeter of at least one of the symbols which is provided by the watermark, an identical complementary or otherwise corresponding symbol is printed using ink, paint, dye, stain or similarly contrasting substance. The watermark is first applied to the paper which then passes through a curing station prior to printing of the ink, etc.

British Patent Specification No. GB-A-2 159 463 discloses a watermarking technique in which a fluent composition is applied to the paper which is absorbed by the paper and enhances its translucency without substantially affecting its pigmentation. The fluent composition is said to be an oil or alternatively a varnish and a vegetable oil.

British Patent Specification No. GB-A-2 046 173 discloses a rotary press with an additional printing unit in which there is provided, *inter alia*, an impression cylinder and two forme mounting cylinders. The forme mounting cylinders are formed by finishing devices which enable numbering, overprinting, varnishing, gumming, perforating, cutting and punching of the sheets at the same time and in combination. The impression cylinder 3 is in contact with the two forme mounting cylinders.

It is therefore an object of the present invention to alleviate the above-mentioned drawbacks.

According to one aspect of the invention there is provided an apparatus for chemically watermarking paper, which apparatus comprises a container for watermarking chemical; a coater means; an impression cylinder roller; a die cylinder roller having a die mounted thereon; the die cylinder roller being disposed intermediate the impression cylinder roller and the coater means and adjacent thereto; means for transferring

watermarking chemical to the die via the coater means; and means for feeding between the die cylinder roller and the impression cylinder roller; wherein the impression cylinder roller simultaneously acts as an impression cylinder roller of a printing means.

Preferably, the feeding means enables the feeding of discrete sheets of paper.

According to another aspect of the invention there is provided a process for chemically watermarking paper, which process comprises transferring watermarking chemical to a die via a coater means, the die being mounted on a die cylinder roller; and feeding paper between the die on the die cylinder roller and an impression cylinder roller, whereby on rotation of each roller in a suitable direction relative to one another, the die receives a charge of chemical from the coater means which chemical is impressed on the paper as it passes between the impression cylinder roller and the die; wherein the impression cylinder roller simultaneously acts as an impression cylinder roller of a printing means.

Preferably, the paper is fed in discrete sheets.

According to another aspect of the invention, there is provided a printing apparatus comprising a watermarking apparatus according to the invention and a printing means.

Preferably, the printing means is located upstream of the watermarking apparatus.

Preferably, the printing means is located downstream of the watermarking apparatus.

According to another aspect of the invention there is provided a process for chemically watermarking paper and subsequently printing the paper, or vice versa, which process comprises using a printing apparatus according to the invention.

The invention will be understood in greater detail from the following description of preferred embodiments thereof given by way of example only and with reference to the accompanying drawings in which:

Figure 1 shows in diagrammatic form an apparatus according to the invention;

Figure 2 shows in diagrammatic form the basic arrangement of the most important elements of a printing press incorporating the apparatus of Figure 1 of the drawings;

Figure 3 is a cross-sectional view of a die holder for use in the apparatus; and

Figure 4 is a plan view of the holder of Figure 3 of the drawings showing datum line positions.

Referring now to the drawings, and in particular to Figures 1 and 2 thereof, there is shown an apparatus 10 of the invention which comprises a nip roller 11; a first coater roller 12; a second coater roller 13; an impres-

sion cylinder roller 15; and a die cylinder holder 18 in the form of a rotary shell. A die 50 is mounted on the rotary shell 18.

The nip roller 11 and the coater rollers 12 and 13 are different to the known rollers described above in connection with Figure A. The nip roller 11 is made from steel and preferably has a diameter of about 50mm. It is coated with a non-stick polyurethane coater. The diameter of the rollers 12, 13 is preferably from 90 mm to 120 mm and the length of the rollers 12, 13 is preferably from 400 mm to 450 mm. The roller 12 is preferably smaller in diameter when compared with the roller 13. Each roller 12, 13 is made of rubber having a 60 shore hardness.

The nip roller 11, and the coater rollers 12, 13 can be incorporated in a conventional printing press 20 in place of the standard numbering and imprinting unit. This unit is normally located at the end of the printing press 40 adjacent to a delivery section 47. In Figure 2 of the drawings, there is shown a two-colour printing press 40 having the apparatus 10 according to the invention incorporated therein. The components of the printing press 40 are well known and will not be fully described here. However, for the sake of completeness, the main components of the press 40 will be described.

The press 40 comprises a paper magazine 41 from which discrete sheets of paper to be printed are removed sequentially by conventional means for travel in the direction of the arrow 100. However, it will be appreciated that the paper may be fed from a continuous roll of paper for travel in the direction of the arrow 100. The press 40 is a two-colour machine with the first colour being printed of a first rubber blanket cylinder 42 and associated first impression cylinder 43 and the second colour being printed at a second rubber blanket cylinder 44 and associated impression cylinder roller 15.

With particular reference to Figure 1 of the drawings, the roller 18 is mounted on a shaft 19 of the press 40 which heretofore had been used for the purpose of driving a numbering apparatus of the press 40 which numbering apparatus has been removed. Marked on the rotary shell roller 18 is a die 50. The die has a thickness of 2.3mm being made from CYREL PLATE (Trade Mark). The advantage of employing a CYREL PLATE is that it has the ability to accurately transfer watermarking chemical from the coater roller 12 to the paper passing between the rotary shell roller 18 and the impression cylinder roller 15.

In Figure 3 of the drawings, there is shown a section through the rotary shell roller 18 having two shells therein each having a respective die 50a, 50b. In Figure 4 of the drawings there is shown the layout of a grid engraved on the two shells. The dotted lines marked '210' refer to 210mm being the outside measurement of a standard A4 size sheet of paper measured from the line marked '0' which is centered when the two rotary shells are in abutting relationship. It will be appreciated that the distance between the two dotted lines marked

'210' represent the width of an A3 sheet of paper. The dotted lines marked '99', '198' and '297' indicate mm and paper lengths 1/3 A4, 2/3 A4 and A4. The line marked '148.5' represents the centre width of an A4 sheet. The lines marked '105' each represents the centre length of an A4 sheet. It will be appreciated, therefore that the area defined by the lines ABCD represents a A4 sheet; the area defined by the lines BEFC also represents an A4 sheet. The area defined by the lines AEFD represents an A3 sheet. The provision of these grid lines enables the positioning of one or more dies 50a, 50b to be located in the desired location with accuracy and efficiency. The fitting of the die takes a matter of about 60 seconds compared with conventional die positioning techniques which can take 30 minutes or even longer.

As will be observed from Fig. 1 of the drawings, the nip roller 11 is in contact with the coater roller 12 and 13. The first coater roller 12 and the second coater roller 13 are each contactable with the die 50 so as to enable transfer of watermarking chemical from the first coater roller 12 to the die 50. The volume of watermarking chemical coating the die 50 is controlled by the pressure between the nip roller 11 and the first coater roller 12. The pressure may be adjusted in a well-known manner. In addition, the pressure between the coater roller 12 and the die 50 is adjustable as is the pressure between the impression cylinder roller 15 and the die so as to increase the quantity of watermarking chemical to be imparted to the paper.

It will be appreciated that only one coater roller 12 is required but depending on the porosity and nature of the paper to be watermarked, a second roller 13 may be employed 50.

The impression cylinder roller 15 rotates in the direction of the arrow 29; the shaft 19 in the direction of the arrow 28, the second coater roller 13 in the direction of the arrow 27, the first coater roller 12 in the direction of the arrow 26, and the nip roller 11 in the direction of the arrow 25. Paper is fed in the direction of the arrow 100 between the roller 15 and the rotary shell 18. A charge 30 of watermarking chemical may be placed between the rollers 11 and 12. The charge 30 may be replenished from a conventional squeeze to use bottle which eliminates the need for a recycling pump. As the charge 30 of watermarking chemical is relatively small, and the fact that prior to placing a charge of chemical between the rollers 11, 12 the bottle may be agitated so as to reduce the possibility of sedimentation which can sometimes occur with chemicals of the type used for watermarking, considerable savings may be made on relatively expensive watermarking chemicals.

The following Example further illustrates the invention.

EXAMPLE

In this Example a Heidelberg 4 Colour Press with

gearing for numbering is used.

1. Base paper is stacked on the feed table 41 of the printing press 40.

2. Litho plates are applied to the print unit.

3. Correct inks are applied to the ink unit.

4. The appropriate die 50 is put in place of a charge 17 of watermarking chemical is applied between the rollers 11 and 12.

5. The print operator inks the plates and feeds paper through the press 40 which paper travels along the path marked with the arrows 100. The paper is printed by the various colour units and then watermarked. It should be noted that the impression cylinder roller 15 serves to act as such for enabling the print die on the roller 4 to apply ink to the paper and for enabling the die 50 to watermark the paper. The printed and watermarked paper is collected in a bin 47.

The process described above can be used for any size sheets of paper, particularly A2, A3 and A4, especially A4. If the paper is fed from a continuous roll, it may be subsequently cut to the appropriate size.

The present invention thus provides a system which allows considerable reduction in the preparation time required for watermarking and hence a substantial reduction in costs. The printing apparatus of the invention permits the printing and subsequent watermarking of small quantities of paper in a cost effective manner. This apparatus is extremely useful in watermarking stationery such as letter heads and compliments slips, etc. It can also be used in security printing such as birth certificates, insurance certificates or any security documents. The watermarking apparatus of the invention can be used with any printing press, such as lithographic, web, flexographic or continuous form press. The present invention provides for the printing of discrete sheets of paper followed by watermarking or vice versa.

Essentially, therefore, the printing and watermarking of paper may be carried out in a single step operation.

The invention is not limited by or to the specific embodiments described which can undergo considerable variation without departing from the scope of the invention.

Claims

1. An apparatus (10) for chemically watermarking paper, which apparatus (10) comprises a container for watermarking chemical; a coater means (12, 13); an impression cylinder roller (15); a die cylinder

roller (18) having a die (50) mounted thereon; the die cylinder roller (18) being disposed intermediate the impression cylinder roller (15) and the coater means (12, 13) and adjacent thereto; means for transferring watermarking chemical to the die via the coater means (12, 13); and means for feeding paper between the die cylinder roller (18) and the impression cylinder roller (15); characterised in that the impression cylinder roller (15) simultaneously acts as an impression cylinder roller (15) of a printing means (40).

2. An apparatus (10) as claimed in claim 1, wherein the feeding means enables the feeding of discrete sheets of paper.

3. An apparatus (10) as claimed in claim 1 or claim 2, wherein the coater means (12, 13) comprises a duct roller (11) and a coater roller (12), the diameter of each roller being from 90 to 120 mm and the length of each roller being from 400 to 450 mm.

4. A process for chemically watermarking paper, which process comprises transferring watermarking chemical to a die (50) via a coater means (12, 13), the die (50) being mounted on a die cylinder roller (18); and feeding paper between the die (50) on the die cylinder roller (18) and an impression cylinder roller (15), whereby on rotation of each roller (15, 18) in a suitable direction relative to one another, the die (50) receives a charge of chemical from the coater means (12, 13) which chemical is impressed on the paper as it passes between the impression cylinder roller (15) and the die (50); characterised in that the impression cylinder roller (15) simultaneously acts as an impression cylinder roller (15) of a printing means.

5. A process as claimed in claim 4, wherein the paper is fed in discrete sheets.

6. A printing apparatus comprising an apparatus (10) as claimed in any of claims 1-3 and a printing means (40).

7. A printing apparatus as claimed in claim 6, wherein the printing means (40) is located upstream of the watermarking apparatus (10).

8. A printing apparatus as claimed in claim 6, wherein the printing means (40) is located downstream of the watermarking apparatus (10).

9. A process for chemically watermarking paper and subsequently printing the paper, or vice versa, which process comprises using a printing apparatus as claimed in any of claims 6-8.

Patentansprüche

1. Vorrichtung (10) zum chemischen Anbringen von Wasserzeichen auf Papier, umfassend einen Behälter für die wasserzeichenanbringende chemische Verbindung, einen Beschichtungsapparat (12, 13), eine Druckzylinderwalze (15), eine Prägestempelwalze (18) mit einem darauf befestigten Prägestempel (50), wobei die Prägestempelwalze (18) zwischenlagig der Druckzylinderwalze (15) und dem Beschichtungsapparat (12, 13) angebracht ist und, benachbart dazu, Mittel zur Überführung der wasserzeichenanbringenden chemischen Verbindung an den Prägestempel mittels des Beschichtungsapparats (12, 13), sowie Mittel zur Zuführung von Papier zwischen die Prägestempelwalze (18) und die Druckzylinderwalze (15), dadurch gekennzeichnet, daß die Druckzylinderwalze (15) gleichzeitig als Druckzylinderwalze (15) eines Druckmittels (40) wirkt. 5 10 15 20
2. Vorrichtung (10) nach Anspruch 1, wobei mit dem Zuführungsmittel einzelne Papierblätter zugeführt werden können. 25
3. Vorrichtung (10) nach Anspruch 1 oder Anspruch 2, wobei der Beschichtungsapparat (12, 13) eine Duktorwalze (11) und eine Beschichtungswalze (12) aufweist, deren Durchmesser jeweils 90 bis 120 mm und deren Länge jeweils 400 bis 450 mm betragen. 30
4. Verfahren zum chemischen Anbringen von Wasserzeichen auf Papier, wobei man eine wasserzeichenanbringende chemische Verbindung mittels eines Beschichtungsapparats (12, 13) an einen Prägestempel (50) überführt, wobei der Prägestempel (50) auf einer Prägestempelwalze (18) befestigt ist, und man das Papier zwischen dem auf der Prägestempelwalze (18) befindlichen Prägestempel (50) und einer Druckzylinderwalze (15) zuführt, wodurch der Prägestempel (50) bei Drehung der beiden Walzen (15, 18) in einer bezüglich der beiden Walzen geeigneten Richtung eine Füllung der chemischen Verbindung von dem Beschichtungsapparat (12, 13) erhält und die chemische Verbindung bei ihrem Durchgang zwischen der Druckzylinderwalze (15) und dem Prägestempel (50) dem Papier aufgeprägt wird, dadurch gekennzeichnet, daß die Druckzylinderwalze (15) gleichzeitig als Druckzylinderwalze (15) eines Druckmittels (40) wirkt. 35 40 45 50
5. Verfahren nach Anspruch 4, wobei das Papier in Einzelblättern zugeführt wird. 55
6. Druckvorrichtung mit einer Vorrichtung (10) nach einem der Ansprüche 1-3 und einem Druckmittel

(40).

7. Druckvorrichtung nach Anspruch 6, wobei das Druckmittel (40) der wasserzeichenanbringenden Vorrichtung (10) vorgeschaltet ist.
8. Druckvorrichtung nach Anspruch 6, wobei das Druckmittel (40) der wasserzeichenanbringenden Vorrichtung (10) nachgeschaltet ist.
9. Verfahren zum chemischen Anbringen von Wasserzeichen auf Papier mit anschließendem Bedrucken des Papiers, oder umgekehrt, wobei man eine Druckvorrichtung nach einem der Ansprüche 6-8 verwendet.

Revendications

1. Appareil (10) pour filigraner chimiquement du papier, ledit appareil (10) comprenant un récipient pour un produit chimique filigraneur ; des moyens d'enduction (12, 13) ; un rouleau cylindrique d'impression (15) ; un rouleau cylindrique à matrice (18) sur lequel est montée une matrice (50) ; le rouleau cylindrique à matrice (18) étant disposé entre le rouleau cylindrique d'impression (15) et les moyens d'enduction (12, 13) à proximité de ceux-ci ; des moyens pour transférer le produit chimique filigraneur à la matrice par l'intermédiaire des moyens d'enduction (12, 13) ; et des moyens pour distribuer du papier entre le rouleau cylindrique à matrice (18) et le rouleau cylindrique d'impression (15) ; caractérisé en ce que le rouleau cylindrique d'impression (15) sert simultanément de rouleau cylindrique d'impression (15) de moyens d'impression (40).
2. Appareil (10) selon la revendication 1, dans lequel les moyens de distribution permettent la distribution de feuilles de papier discrètes.
3. Appareil (10) selon la revendication 1 ou la revendication 2, dans lequel les moyens d'enduction (12, 13) comprennent un rouleau de conduite (11) et un rouleau d'enduction (12), le diamètre de chaque rouleau étant de 90 à 120 mm et la longueur de chaque rouleau étant de 400 à 450 mm.
4. Procédé pour filigraner chimiquement du papier, ledit procédé comprenant les étapes consistant à transférer un produit chimique filigraneur sur une matrice (50) par l'intermédiaire de moyens d'enduction (12, 13), la matrice (50) étant montée sur un rouleau cylindrique à matrice (18) ; et à distribuer du papier entre la matrice (50) sur le rouleau cylindrique à matrice (18) et un rouleau cylindrique d'impression (15), de sorte que lors de la rotation de chaque rouleau (15, 18) dans une direction appropriée l'un par rapport à l'autre, la matrice (50)

reçoive une charge de produit chimique des moyens d'enduction (12, 13), ledit produit chimique étant imprimé sur le papier lorsqu'il passe entre le rouleau cylindrique d'impression (15) et la matrice (50) ; caractérisé en ce que le rouleau cylindrique d'impression (15) sert simultanément de rouleau cylindrique d'impression (15) de moyens d'impression.

5. Procédé selon la revendication 4, dans lequel le papier est distribué en feuilles discrètes. 10
6. Appareil d'impression comprenant un appareil (10) selon l'une quelconque des revendications 1 à 3 et des moyens d'impression (40). 15
7. Appareil d'impression selon la revendication 6, dans lequel les moyens d'impression (40) sont situés en amont de l'appareil à filigraner le papier (10). 20
8. Appareil d'impression selon la revendication 6, dans lequel les moyens d'impression (40) sont situés en aval de l'appareil à filigraner le papier (10). 25
9. Procédé pour filigraner chimiquement du papier et imprimer ensuite le papier, ou vice versa, ledit procédé comprenant l'utilisation d'un appareil d'impression selon l'une quelconque des revendications 6 à 8. 30

35

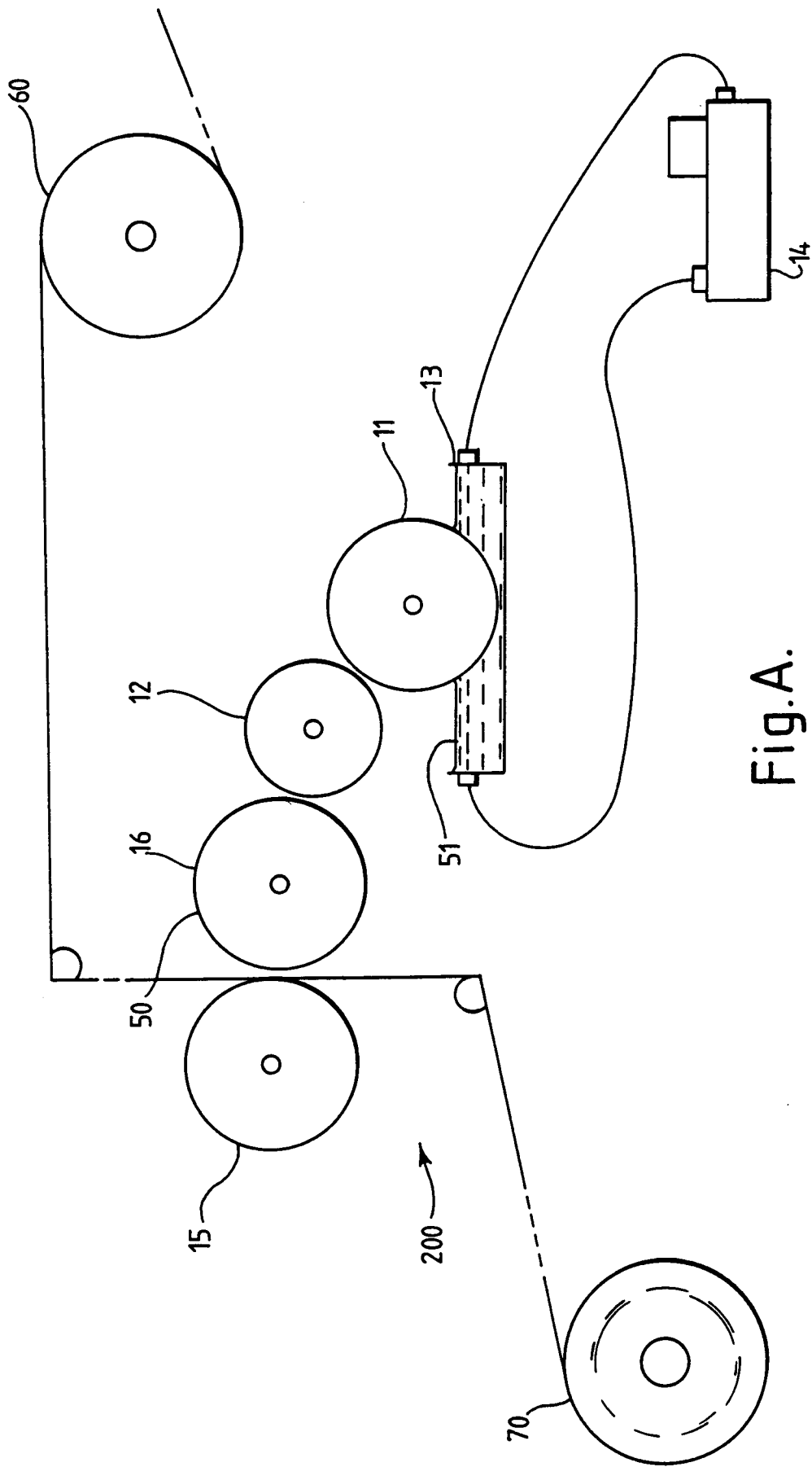
40

45

50

55

PRIOR ART



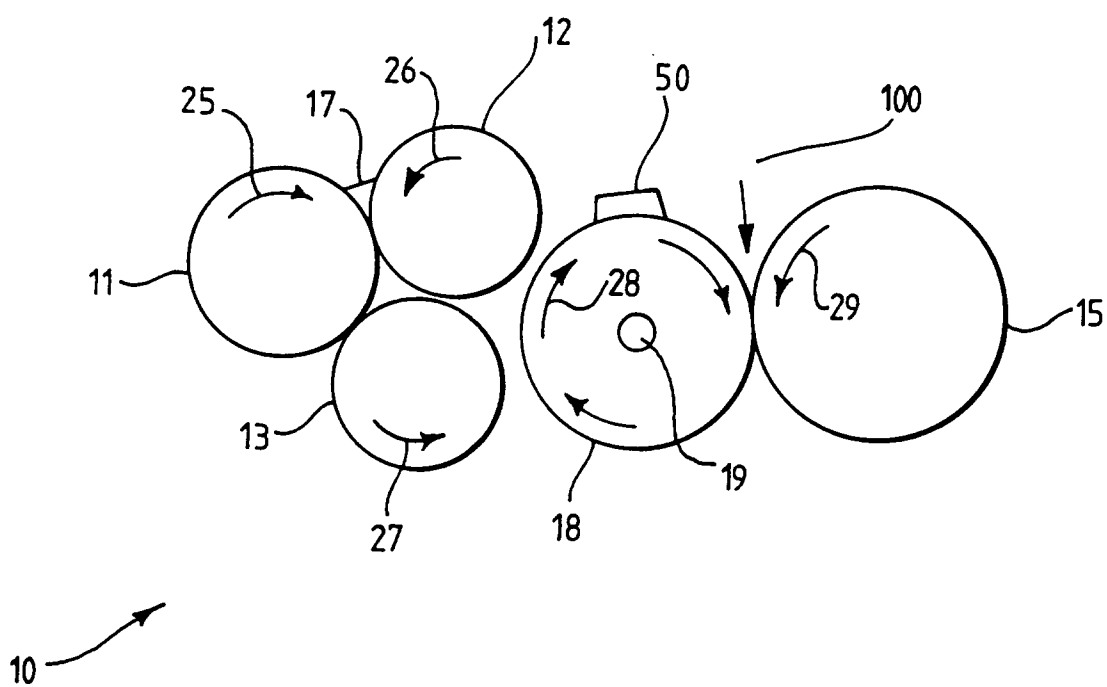


Fig.1.

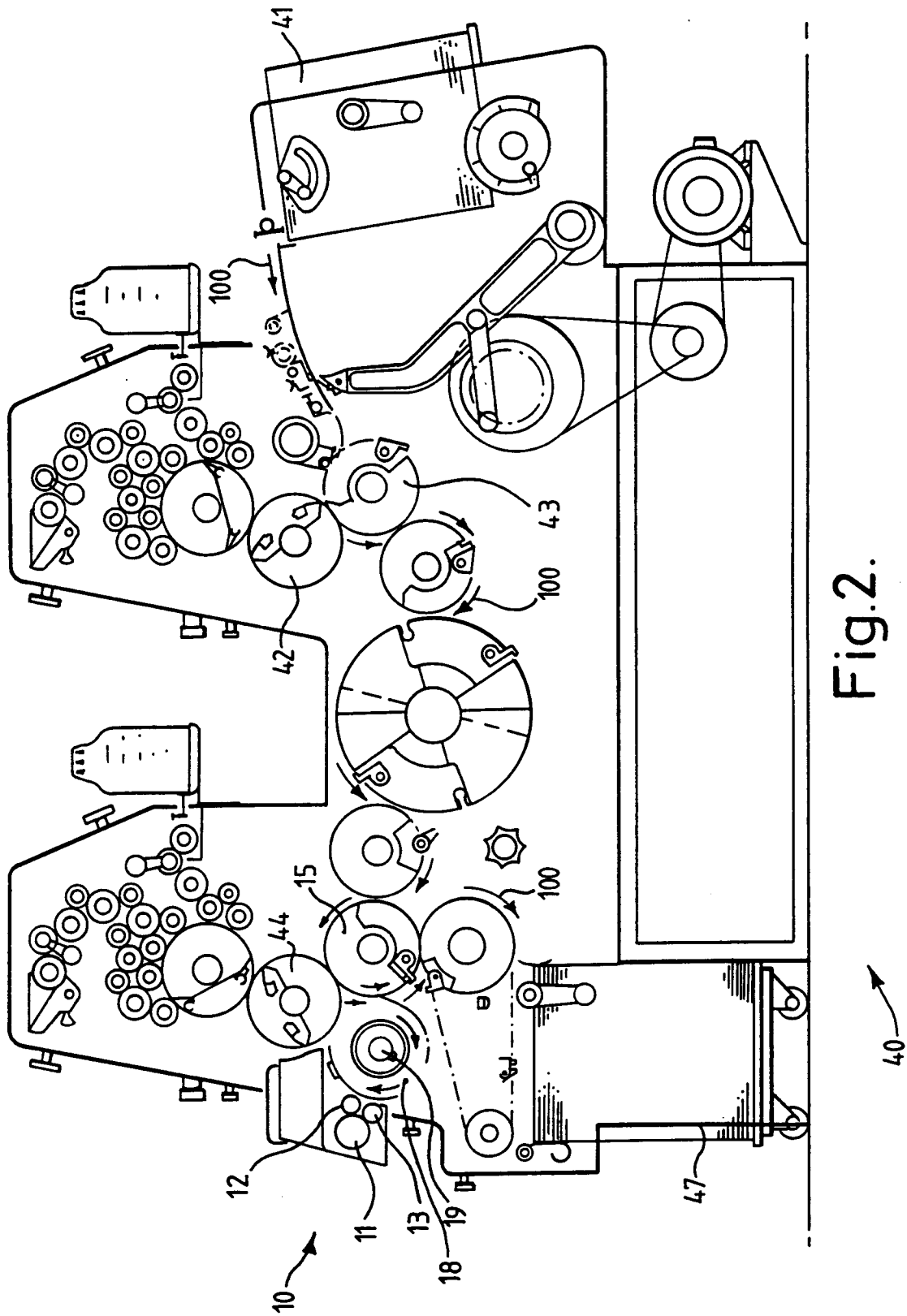


Fig. 2.

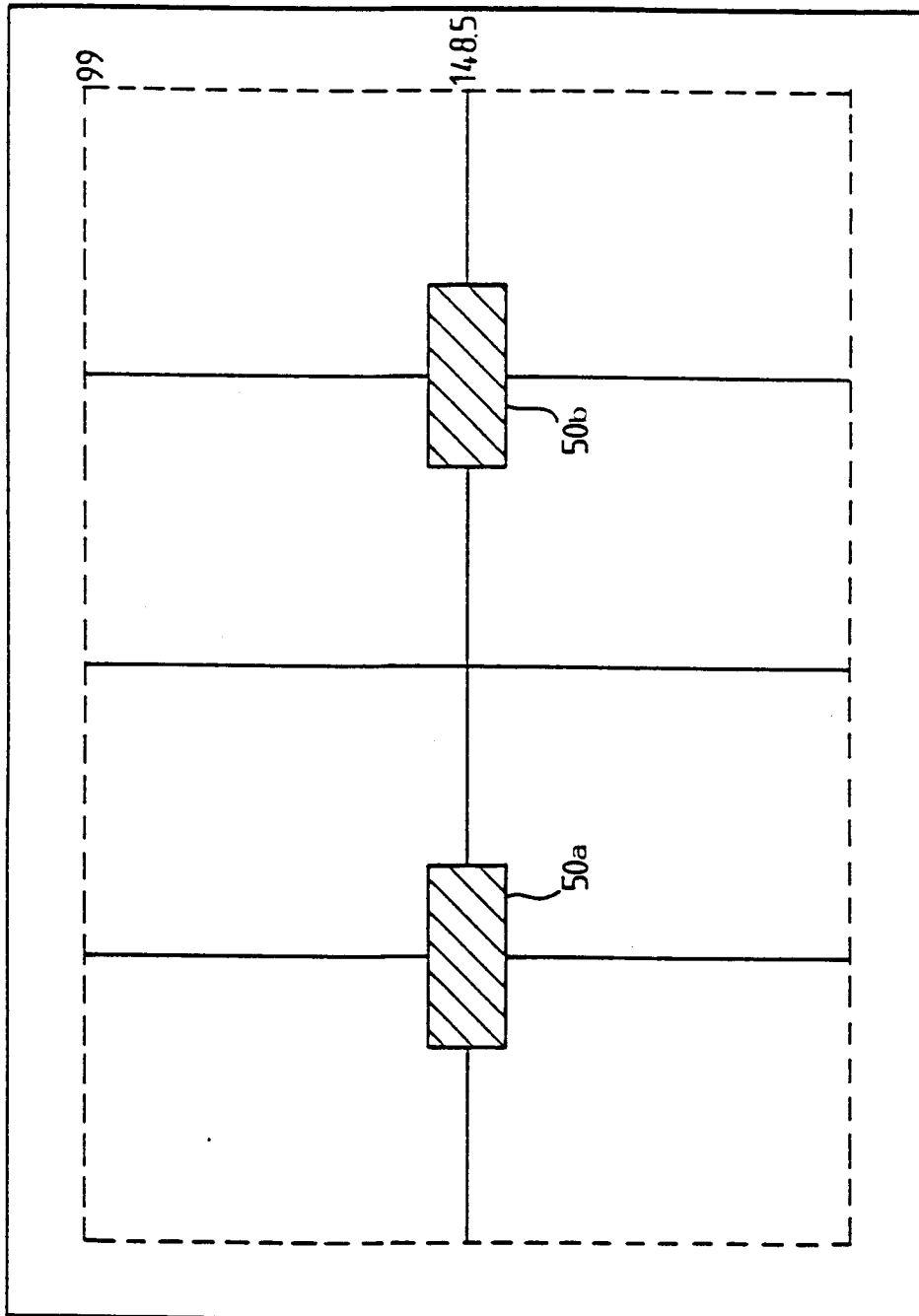


Fig.3.

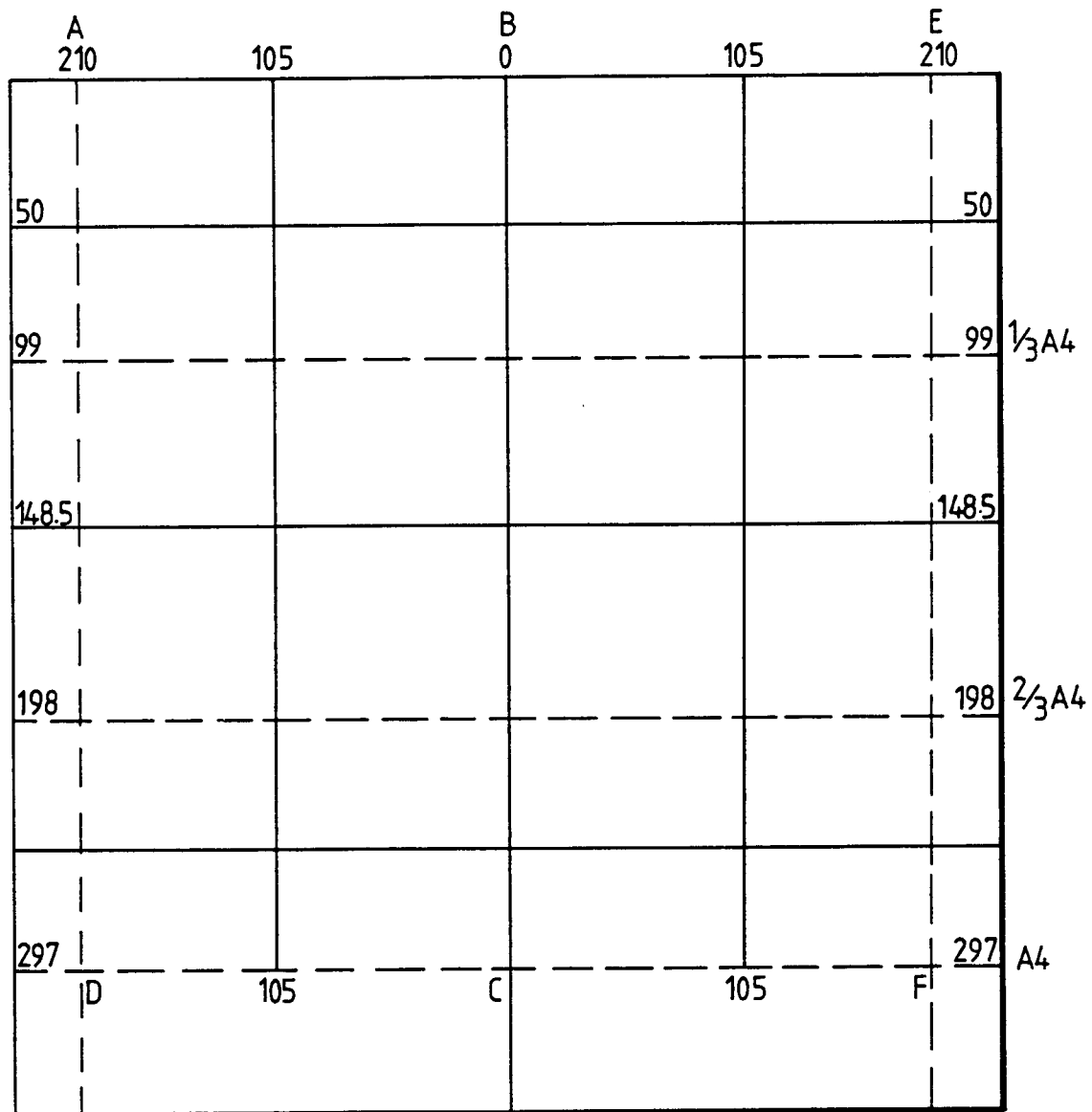


Fig.4.