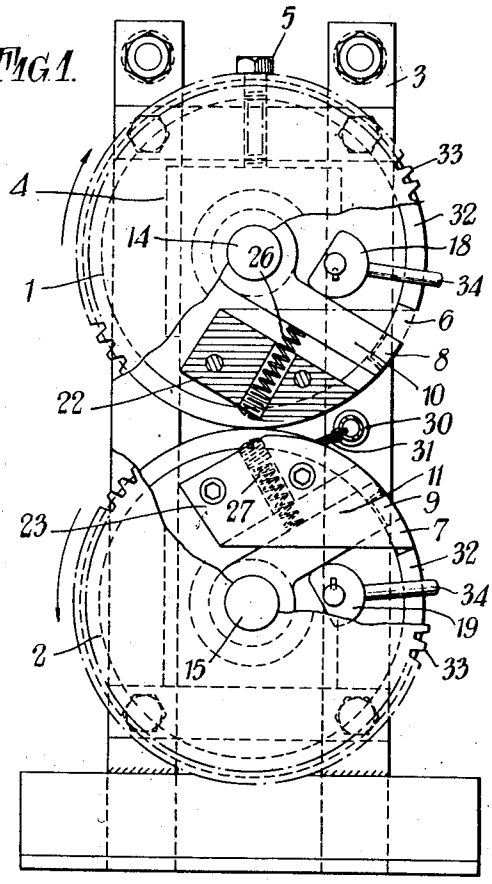
Aug. 6, 1957 W. D. KENNEDY ET AL 2,801,580

APPARATUS FOR TRANSFERRING A PHOTOGRAPHIC IMAGE

Filed April 22, 1955 2 Sheets-Sheet 1

FIG. 1.



Inventors
Walter David Kennedy
Sidney Alfred Joseph Fenton
by
Stevens, Davis, Miller & Mosher
their attorneys

Aug. 6, 1957 W. D. KENNEDY ET AL 2,801,580

APPARATUS FOR TRANSFERRING A PHOTOGRAPHIC IMAGE

Filed April 22, 1955 2 Sheets-Sheet 2

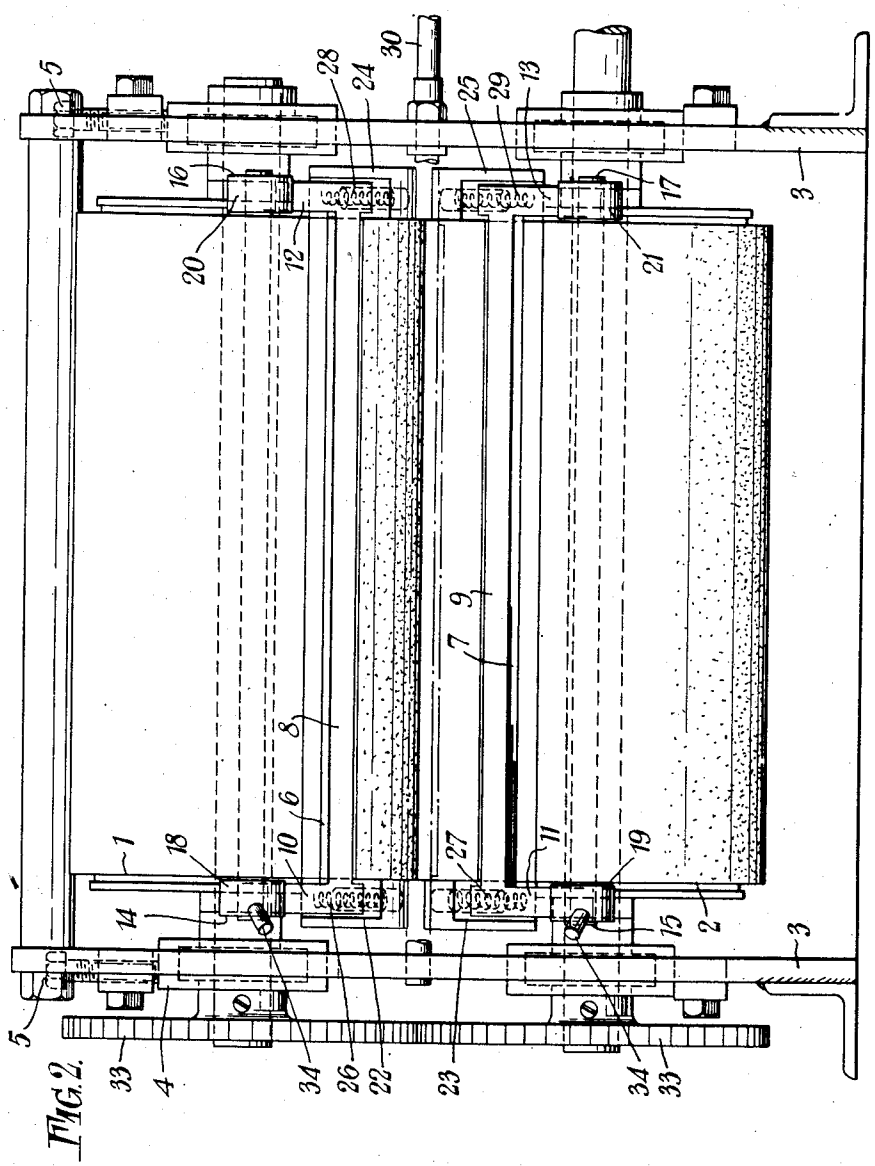


FIG. 2.

Inventors,
Walter David Kennedy
Sidney Alfred Joseph Fenton
by
Stevens, Davis, Miller & Mosher
their attorneys

United States Patent Office 2,801,580 Patented Aug. 6, 1957

2,801,580

APPARATUS FOR TRANSFERRING A PHOTOGRAPHIC IMAGE

Walter David Kennedy and Sidney Alfred Joseph Fenton, Balham, London, England, assignors to Kennedy Instruments Limited, London, England, a British company

Application April 22, 1955, Serial No. 503,139

Claims priority, application Great Britain April 30, 1954

11 Claims. (Cl. 95—89)

This invention relates to apparatus for transferring a photographic image.

In the course of the last few years several forms of apparatus have been devised for handling a relatively new type of photographic material in which an image formed in the material is transferred to a reception sheet. The apparatus comprises essentially some means of guiding the transfer material through a zone in which the image is rendered transferable, some means of guiding the reception sheet to bring it in contact with the transfer sheet at a point where the image on the transfer sheet has become transferable, and a pair of rollers through which the transfer material and the reception sheet pass in contact under a controlled pressure so that the image on the transfer sheet is transferred to the reception sheet.

Prior proposals for such apparatus have generally been rather complicated in design and have had disadvantages. In particular it has been the case that the transfer sheet and reception sheet cling together as they leave the press rollers and have to be separated by hand. Since in some transfer processes the quality of the transferred image has depended on the duration of time that the sheets are pressed together and on the evenness with which the sheets are separated, such apparatus has required a relatively skilled attendant.

It is an object of this invention to provide an entirely new form of such apparatus in which the separation of the sheets, after they pass the press rollers, is automatically effected under controlled conditions and wherein, in particular forms of the invention, novel means for rendering the image transferable are employed.

According to the present invention apparatus for transferring a photographic image from a sheet material on which it is formed (hereinafter called the transfer sheet) to another sheet (hereinafter called the reception sheet) comprises a pair of similar press rollers of which the circumference is greater than the length of the said sheets, means for removably securing the leading edge of the transfer sheet to one said roller and the leading edge of the reception sheet to the other said roller, means for causing the said rollers to rotate to cause the sheets thus held to pass through the nip of the said rollers and there to be pressed together, and means for applying at least to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable.

By developing liquid is meant any liquid which on application to the transfer sheet causes or facilitates the transfer of the image therefrom to the reception sheet. In certain cases, as hereinafter explained, the developing liquid may be simply water.

In using apparatus as aforesaid, the transfer sheet and reception sheet are secured by their leading edges to the respective rollers and the rollers are set in rotation, the effect being to bring the areas immediately following the two leading edges together as they pass through the nip of the rollers and, of course, to apply pressure to the sheets over their whole length as they pass through the nip. Since the trailing edges of the sheets are not secured, they become free as soon as they clear the nip of the rollers, and the sheets may then be removed from the rollers by releasing their leading edges therefrom.

It will be appreciated that by means of this invention an entirely uniform pressure is applied to the sheets and they are separated from one another by the turning action of the rollers themselves in an entirely regular manner. Moreover, the passage of time from the moment that a part of the sheets is pressed together to the moment when they are separated is exactly uniform over the whole of the sheets and, for pre-set apparatus, constant for each successive transfer operation. The exact conditions of pressure and duration are simply dictated by setting the pressure between the rollers and their speed of rotation.

It is of course necessary, as stated above, to render the image on the transfer sheet transferable at a point prior to its passage through the nip of the rollers. Whilst it is possible to apply a suitable developing liquid to the transfer sheet, and also to the reception sheet if that is considered necessary or desirable, by causing the rollers to rotate in a bath of the developing liquid, it is more convenient in practice to apply the developing liquid to the rollers at a suitable position in their rotational path. Thus, the rest position of the rollers may be where the means for securing the sheets to the rollers are spaced well away from the nip of the rollers and any means of feeding liquid to the rollers located between such securing means and the nip of the rollers. Thus, liquid may be supplied via a wick device extending across the width of the rollers, the said wick being movable from a position of rest away from the rollers to one in which the wick is in contact with the transfer sheet after that has been located on its roller and the rollers started in their rotation.

However, it is preferred to apply the developing liquid at or very close to the nip of the rollers. This may be achieved by means of a fixed wick supplied with liquid and located very close to the nip of the rollers. Alternatively, it may be arranged that the axes of the rollers are in a horizontal plane so that the nip constitutes a well which is constantly fed with the developing liquid. In that case the sheets pass through this well of liquid just before they enter the nip. The use of a wick is advantageous, however, in that it not only acts as a filter for the liquid, but also serves by its brushing action on the surface of the sheet or sheets to effect a more even wetting of the surfaces. If desired, using a horizontal assembly, both wick applicator and a well of liquid may be employed. The liquid may be supplied to the well or to the wick by means of a gravity feed, or may be pumped. In the case where the liquid is simply water, it is convenient to connect the wick conduit to a mains water tap.

Whilst various mechanisms for releasably securing the leading edges of the sheets may be employed, it is generally convenient to provide some sort of clamp mechanism inset into the surface of each roller and such that it does not project outside the natural circumference of the roller. Conveniently, the rollers may be provided with a hard rubber sleeving, each roller having a longitudinal slot in its circumference with means in the slot for gripping the leading edge of a transfer sheet or reception sheet presented thereto, the rollers being disposed so that on rotation the two slots pass through the nip of the rollers together. In a specific form of apparatus the slot may house a longitudinal bar and means be provided for moving that bar from a position in which it bears towards an inner face of the slot and a position in which it is remote from said face. The said bar, when bearing towards the face of the slot, will then serve to grip the leading edge of a transfer or reception sheet between itself and that face. The bar is conveniently

mounted on one end of each of a pair of pivoted levers located at the ends of the roller, the levers being spring-loaded, and a manually operated cam provided for controlling the position of the levers and therefore the position of the bar in the slot. In the foregoing apparatus it is desirable that plates should be provided at the ends of the rollers so located that when the slots pass together through the nip of the rollers the pressure between the rollers is taken by the end plates and not by the rubber surface of the rollers themselves.

Advantageously, the whole apparatus is mechanised so that on energising the apparatus a single complete revolution of the rollers takes place, the rollers thus returning to their original position. There can then be provided suitable guideways or chutes at the rest position of the securing devices so that the sheets may be supplied through such guideways and quite simply locked to the rollers. At the end of a revolution the sheets (in respect of which the transfer is now completed) may be released from the rollers manually, or may be released to fall down separate guideways or chutes.

A particular form of apparatus according to the present invention is diagrammatically illustrated in the accompanying drawings in which—

Figure 1 illustrates the apparatus in end elevation and part section and

Figure 2 illustrates the apparatus in front elevation.

Referring to these drawings the apparatus comprises two press rollers **1** and **2** of identical dimensions. These are mounted in bearings in a supporting framework **3** and an electric motor or other source of power, not shown, is provided to drive them through gears **33**. The frame **3** carries a pressure plate **4** and adjusting screws **5** by means of which the pressure between the rollers **1** and **2** can be adjusted. The rollers **1** and **2** are provided with rubber coverings **32** and are of generally smooth circumferential surface. However, slots **6** and **7** are cut in the rubber covering. Housed in these slots **6** and **7** are locking bars **8** and which are secured at their ends to levers **10, 11, 12** and **13**. These levers are mounted on pivots **14, 15, 16, 17** in the ends of the rollers. Associated with the levers **10, 11, 12** and **13** are cams **18, 19, 20** and **21**, cams **18** and **19** being provided with extension arms **34** for manual operation.

Also provided at the ends of the rollers are guide plates **22, 23, 24** and **25** so shaped that when the slots **6** and **7** are together in the nip of the rollers, the pressure between the rollers is taken substantially by the guide plates in question. These plates also serve as housings for springs **26, 27, 28, 29** which act on the levers **10, 11, 12, 13**. A supply conduit **30** for developer liquid is located close to the nip of the rollers and is provided with an applicator wick **31**.

In using the said apparatus the cams **18, 19, 20** and **21** are moved to press the levers **10, 11, 12, 13** against the springs **26, 27, 28** and **29**, the leading edge of a transfer sheet is placed between the locking bar **8** and the side of the slot **6** and the leading edge of a reception sheet is placed between the locking bar **9** and the side of the slot **7**. The cams **18, 19, 20** and **21** are moved by the arms **34** to allow the levers **10, 11, 12, 13** to move and, under the action of the springs **26, 27, 28** and **29**, to press the locking bar **8** against the side of the slot **6**, thus gripping the transfer sheet and the locking bar **9** against the side of the slot **7**, thus gripping the reception sheet. The rollers **1** and **2** are then caused to rotate synchronously in the directions shown by the arrows, thus carrying the transfer sheet and the reception sheet through the nip. Just before it enters the nip the exposed leading area of the transfer sheet makes contact with the wick applicator **31** and is thus wetted with developer liquid. When the sheets have been drawn completely through the nip, their trailing ends are free and the sheets are removed from the slots merely by reversing the position of the cams in order to draw the bars **8** and **9** away from the sides of the slots **6** and **7**.

The apparatus of the invention is of particular value in the "development" and transfer of materials such as those where the transfer material carries a pigment layer the transferability of which, under the influence of water, is affected by photographic exposure. In such materials it is merely necessary to apply water to the exposed transfer sheet and to bring the wetted transfer sheet into contact with the reception sheet under a controlled pressure to effect the image transfer. In some apparatus previously suggested the water has been contained in a trough, and eventually the water has become so contaminated with chemicals picked up from the sheets as to become useless. It is an advantage of the preferred forms of the present invention that the water or other developing liquid may be fed continuously to its position of application so that fresh liquid is always present at that position, e. g. at the wick edge in the apparatus referred to above. Indeed, as already indicated, when the liquid employed is water the conduit may be simply connected to a slow running mains water tap.

The apparatus is also of value in the so-called transfer diffusion process as described, for example, in British Patents Nos. 614,155 and 654,630.

We claim:

1. Apparatus for transferring a photographic image from a transfer sheet to a reception sheet which comprises a pair of similar press rollers provided with resilient surfaces of which the circumference is greater than the length of the said sheets, each said roller having a longitudinal slot formed in its circumference, a first longitudinal bar within one said slot and means for moving said bar from a position in which it bears towards one inner face of the said slot to a position in which it is remote from said face, the said bar when bearing towards an inner face of the slot serving to grip the leading edge of a transfer sheet between itself and said face, a second longitudinal bar within the said other slot and means for moving said second bar from a position in which it bears towards one inner face of the said other slot to a position in which it is remote from said face, the said second bar when bearing towards an inner face of the said other slot serving to grip the leading edge of a reception sheet between itself and said face, the said rollers being disposed so that on rotation the said slots pass through the nip of the rollers together, means for causing the said rollers to rotate to cause the sheets thus gripped to pass through the nip of the said rollers and there to be pressed together, and means for applying at least to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable.

2. Apparatus for transferring a photographic image from a transfer sheet to a reception sheet which comprises a pair of similar press rollers provided with resilient surfaces of which the circumference is greater than the length of the said sheets, each said roller having a longitudinal slot formed in its circumference, a first longitudinal bar within one said slot and means for moving said bar from a position in which it bears towards one inner face of the said slot to a position in which it is remote from said face, the means including a pair of pivoted levers located at the ends of the roller and supporting the ends of the bar, the said levers being spring-loaded and associated with cam means to control the position of the levers, and accordingly the position of the bar in the slot, the said bar when bearing towards an inner face of the slot serving to grip the leading edge of a transfer sheet between itself and said face, a second longitudinal bar within the said other slot and means for moving said second bar from a position in which it bears towards one inner face of the said other slot to a position in which it is remote from said face, the means including a pair of pivoted levers located at the ends of the roller and supporting the ends of the bar, the said levers being spring-loaded and associated with cam means to control the position of the levers, and ac-

cordingly the position of the bar in the slot, the said second bar when bearing towards an inner face of the said other slot serving to grip the leading edge of a reception sheet between itself and said face, the said rollers being disposed so that on rotation the said slots pass through the nip of the rollers together, means for causing the said rollers to rotate to cause the sheets thus gripped to pass through the nip of the said rollers and there to be pressed together, and means for applying at least to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable.

3. Apparatus for transferring a photographic image from a transfer sheet to a reception sheet which comprises a pair of similar press rollers having resilient surfaces of which the circumference is greater than the length of said sheets, each said roller having a longitudinal slot in its circumference, means within the said slot of one said roller for gripping the leading edge of a transfer sheet presented thereto, means within the said slot of the other said roller for gripping the leading edge of a reception sheet presented thereto, the said rollers being disposed so that on rotation the said slots pass through the nip of the rollers together, means for relieving the pressure between the rollers while the slots pass through the nip thereof, means for causing the said rollers to rotate to cause the sheets thus gripped to pass through the nip of the said rollers and there to be pressed together, and means for applying at least to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable.

4. Apparatus for transferring a photographic image from a transfer sheet to a reception sheet which comprises a pair of similar press rollers having resilient surfaces of which the curcumference is greater than the length of said sheets, each said roller having a longitudinal slot in its circumference, means within the said slot of one said roller for gripping the leading edge of a transfer sheet presented thereto, means within the said slot of the other said roller for gripping the leading edge of a reception sheet presented thereto, the said rollers being disposed so that on rotation the said slots pass through the nip of the rollers together, means for relieving the pressure between the rollers while the slots pass through the nip thereof, said means comprising arcuate bearing surfaces at the ends of the rollers and coincident with the natural generating line of the circumference of the rollers over the width of the slots, means for causing the said rollers to rotate to cause the sheets thus gripped to pass through the nip of the said rollers and there to be pressed together, and means for applying at least to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable.

5. Apparatus for transferring a photographic image from a transfer sheet to a reception sheet which comprises a pair of similar press rollers provided with resilient surfaces of which the circumference is greater than the length of the said sheets, each said roller having a longitudinal slot formed in its circumference, a first longitudinal bar within one said slot and means for moving said bar from a position in which it bears towards one inner face of the said slot to a position in which it is remote from said face, the said bar when bearing towards an inner face of the slot serving to grip the leading edge of a transfer sheet between itself and said face, a second longitudinal bar within the said other slot and means for moving said second bar from a position in which it bears towards one inner face of the said other slot to a position in which it is remote from said face, the said second bar when bearing towards an inner face of the said other slot serving to grip the leading edge of a reception sheet between itself and said face, the said rollers being disposed so that on rotation the said slots pass through the nip of the rollers together, means for relieving the pressure between the rollers while the slots pass through the nip thereof comprising arcuate bearing surfaces at the ends of the rollers and coincident with the natural generating line of the circumference of the rollers over the width of the slots, means for causing the said rollers to rotate to cause the sheets thus gripped to pass through the nip of the said rollers and there to be pressed together, and means for applying at least to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable.

6. Apparatus for transferring a photographic image from a transfer sheet to a reception sheet which comprises a pair of similar press rollers of which the circumference is greater than the length of the said sheets, means for removably securing the leading edge of the transfer sheet to one said roller and the leading edge of the reception sheet to the other said roller, means for causing the said rollers to rotate to cause the sheets thus held to pass through the nip of the said rollers and there to be pressed together, and means for applying at least to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable, said means for applying developing liquid comprising a feed line for said liquid extending across the width of the transfer sheets for which the apparatus is dimensioned at a point close to the intake side of the nip of the rollers.

7. Apparatus for transferring a photographic image from a transfer sheet to a reception sheet which comprises a pair of similar press rollers provided with resilient surfaces of which the circumference is greater than the length of the said sheets, each said roller having a longitudinal slot formed in its circumference, a first longitudinal bar within one said slot and means for moving said bar from a position in which it bears towards one inner face of the said slot to a position in which it is remote from said face, the said bar when bearing towards an inner face of the slot serving to grip the leading edge of a transfer sheet between itself and said face, a second longitudinal bar within the said other slot and means for moving said second bar from a position in which it bears towards one inner face of the said other slot to a position in which it is remote from said face, the said second bar when bearing towards an inner face of the said other slot serving to grip the leading edge of a reception sheet between itself and said face, the said rollers being disposed so that on rotation the said slots pass through the nip of the rollers together, means for relieving the pressure between the rollers while the slots pass through the nip thereof comprising arcuate bearing surfaces at the ends of the rollers and coincident with the natural generating line of the circumference of the rollers over the width of the slots, means for causing the said rollers to rotate to cause the sheets thus gripped to pass through the nip of the said rollers and there to be pressed together, and means for applying at least to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable, said means for applying developing liquid comprising a feed line for said liquid extending across the width of the transfer sheets for which the apparatus is dimensioned at a point close to the intake side of the nip of the rollers.

8. Apparatus for transferring a photographic image from a transfer sheet to a reception sheet which comprises a pair of similar press rollers of which the circumference is greater than the length of the said sheets, means for removably securing the leading edge of the transfer sheet to one said roller and the leading edge of the reception sheet to the other said roller, means for causing the said rollers to rotate to cause the sheets thus held to pass through the nip of the said rollers and there to be pressed together, and means for applying at least

to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable, said means for applying developing liquid comprising a feed line for said liquid extending across the width of the transfer sheets for which the apparatus is dimensioned at a point close to the intake side of the nip of the rollers, and a wick fed by said feed line and disposed to bear uniformly against, and fully across the width of, the transfer sheet.

9. Apparatus for transferring a photographic image from a transfer sheet to a reception sheet which comprises a pair of similar press rollers provided with resilient surfaces of which the circumference is greater than the length of the said sheets, each said roller having a longitudinal slot formed in its circumference, a first longitudinal bar within one said slot and means for moving said bar from a position in which it bears towards one inner face of the said slot to a position in which it is remote from said face, the said bar when bearing towards an inner face of the slot serving to grip the leading edge of a transfer sheet between itself and said face, a second longitudinal bar within the said other slot and means for moving said second bar from a position in which it bears towards one inner face of the said other slot to a position in which it is remote from said face, the said second bar when bearing towards an inner face of the said other slot serving to grip the leading edge of a reception sheet between itself and said face, the said rollers being disposed so that on rotation the said slots pass through the nip of the rollers together, means for relieving the pressure between the rollers while the slots pass through the nip thereof comprising arcuate bearing surfaces at the ends of the rollers and coincident with the natural generating line of the circumference

of the rollers over the width of the slots, means for causing the said rollers to rotate to cause the sheets thus gripped to pass through the nip of said rollers and there to be pressed together, and means for applying at least to the transfer sheet, at a point prior to its passage through the nip of the rollers, a developing liquid for rendering the image on the transfer sheet transferable, said means for applying developing liquid comprising a feed line for said liquid extending across the width of the transfer sheets for which the apparatus is dimensioned at a point close to the intake side of the nip of the rollers, and a wick fed by said feed line and disposed to bear uniformly against, and fully across the width of, the transfer sheet.

10. Apparatus according to claim 1 wherein the rollers are arranged on parallel axes in a horizontal plane and means are provided for feeding developing liquid to the upper intake side of the nip to constitute a well of liquid between the rollers.

11. Apparatus according to claim 5 wherein the rollers are arranged on parallel axes in a horizontal plane and means are provided for feeding developing liquid to the upper intake side of the nip to constitute a well of liquid between the rollers.

References Cited in the file of this patent

UNITED STATES PATENTS

455,404	Kelly	July 7, 1891
854,041	Kenna	May 21, 1907
2,371,925	Schade et al.	Mar. 20, 1945
2,378,478	Harless	June 19, 1945
2,572,450	Crissy	Oct. 23, 1951
2,664,801	Eisbein	Jan. 5, 1954