July 7, 1964 W. RITZERFELD ETAL 3,139,808

METHOD AND APPARATUS FOR MAKING PRINTING FORM SHEETS

Filed April 25, 1961 5 Sheets-Sheet 1

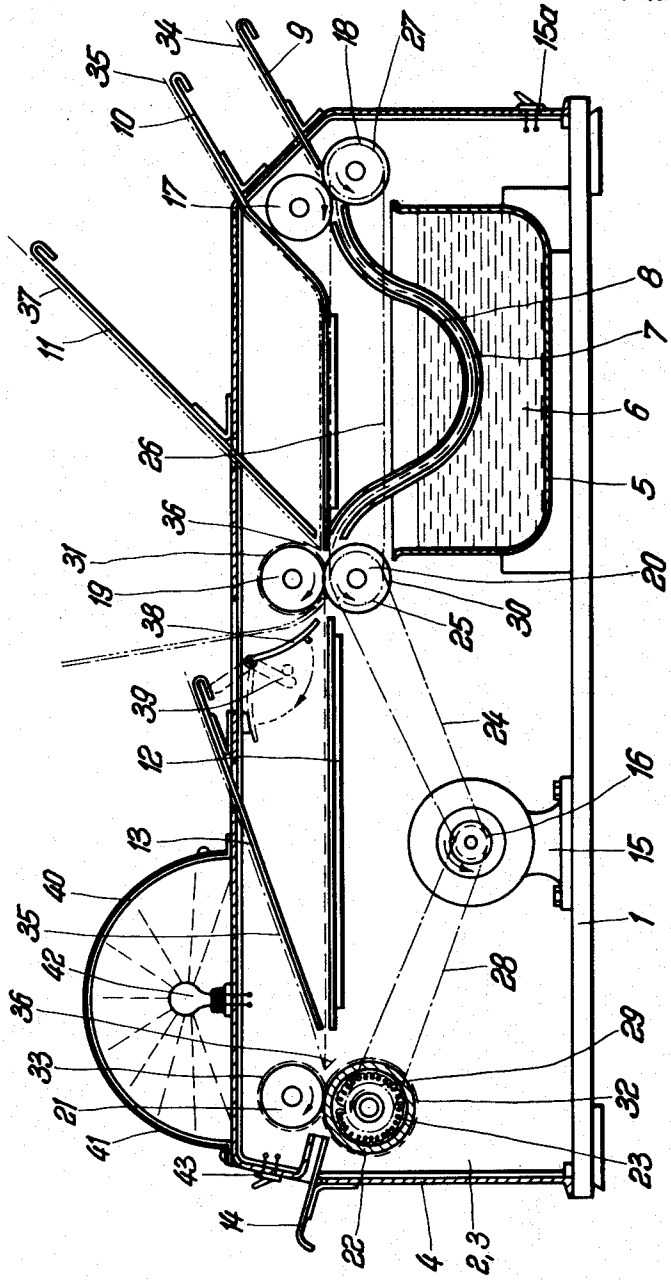


Fig. 1

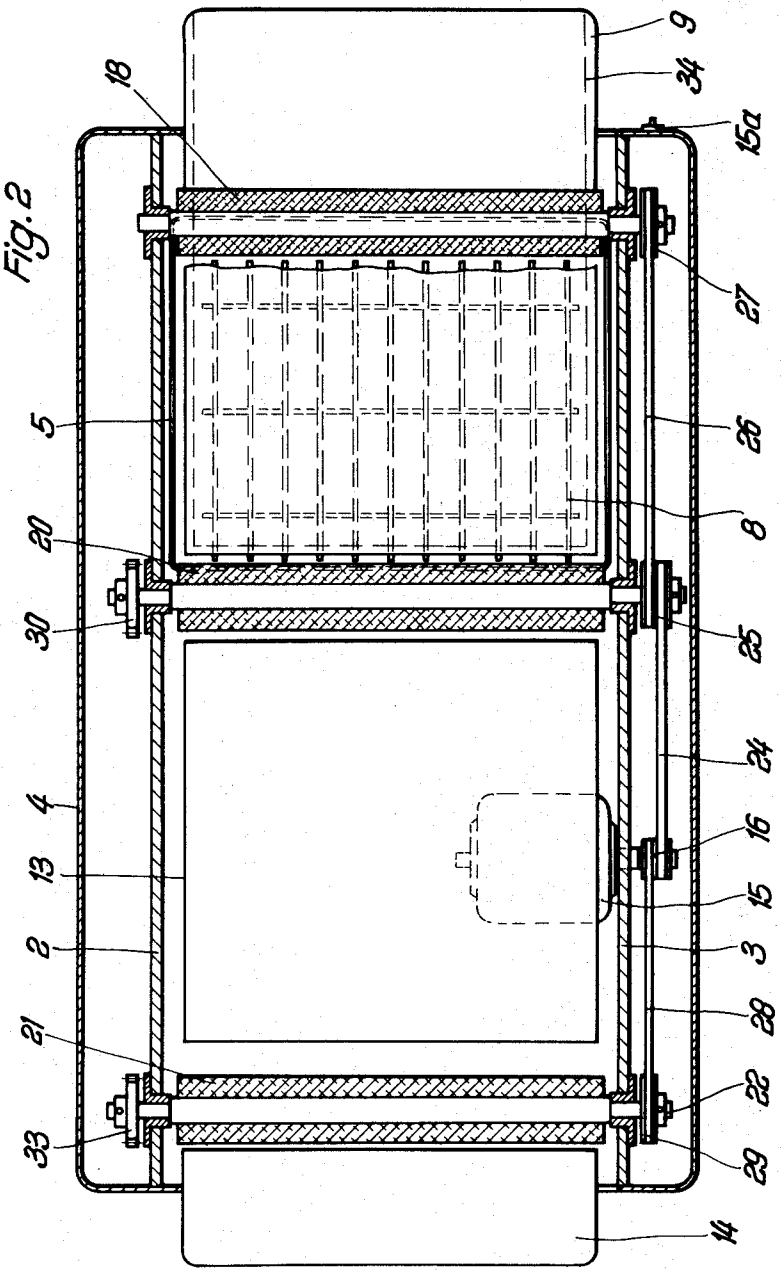
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METHOD AND APPARATUS FOR MAKING PRINTING FORM SHEETS

Filed April 25, 1961 5 Sheets-Sheet 2

Fig. 2



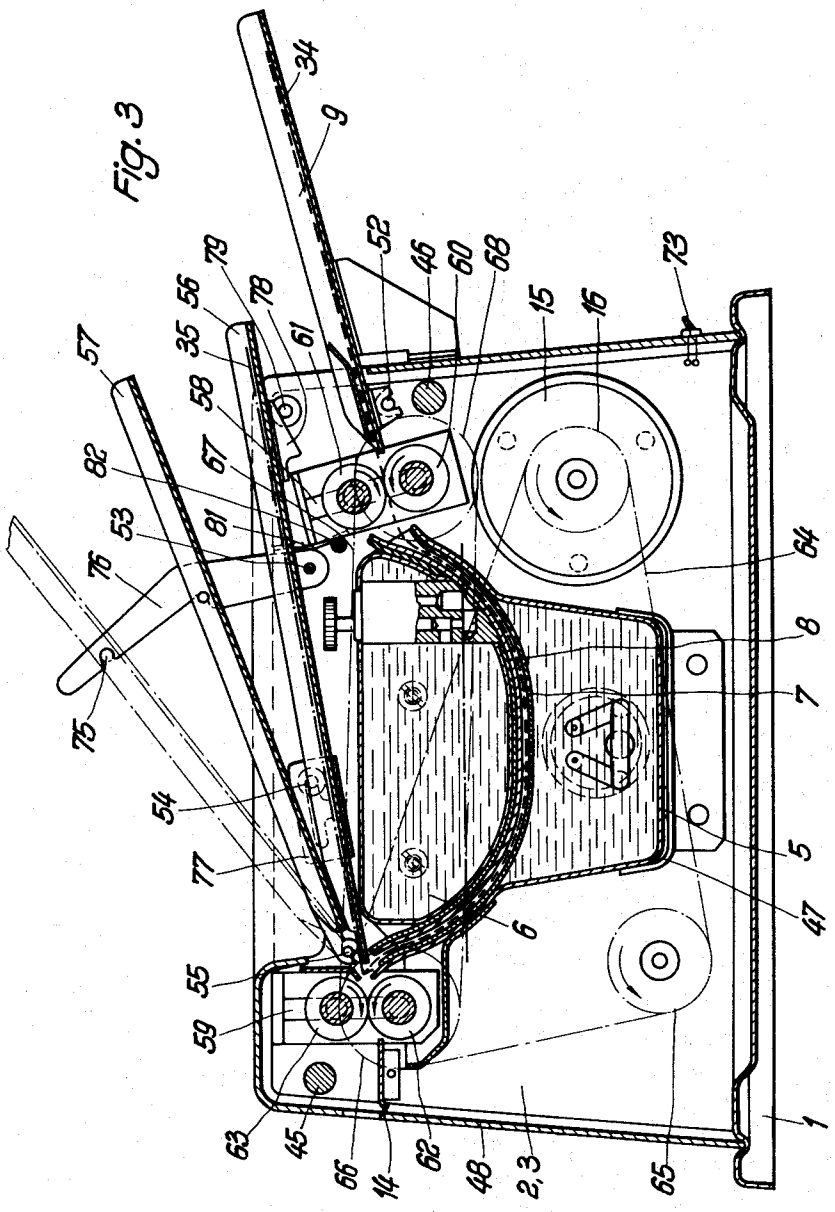
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METHOD AND APPARATUS FOR MAKING PRINTING FORM SHEETS

Filed April 25, 1961 5 Sheets-Sheet 3

Fig. 3



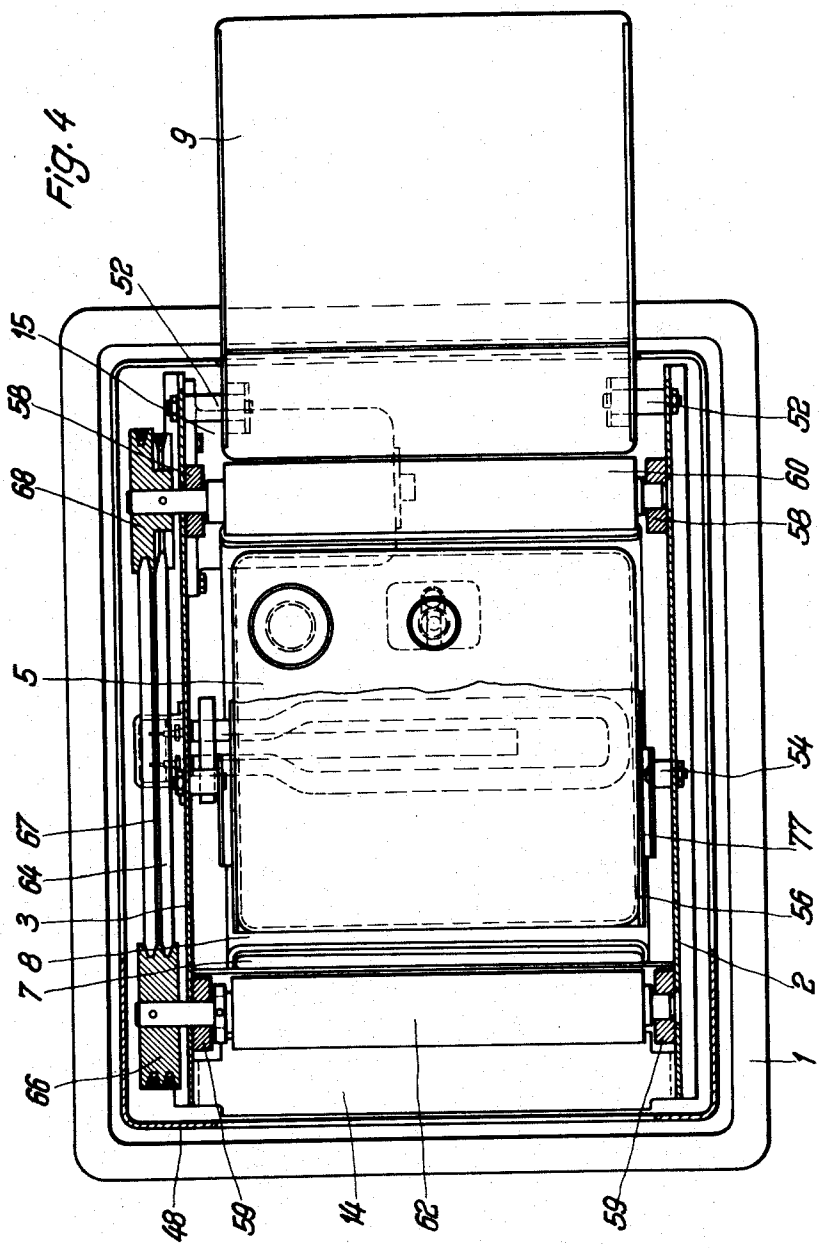
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METHOD AND APPARATUS FOR MAKING PRINTING FORM SHEETS

Filed April 25, 1961 5 Sheets-Sheet 4

Fig. 4



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July 7, 1964 W. RITZERFELD ETAL 3,139,808

METHOD AND APPARATUS FOR MAKING PRINTING FORM SHEETS

Filed April 25, 1961 5 Sheets-Sheet 5

Fig. 5

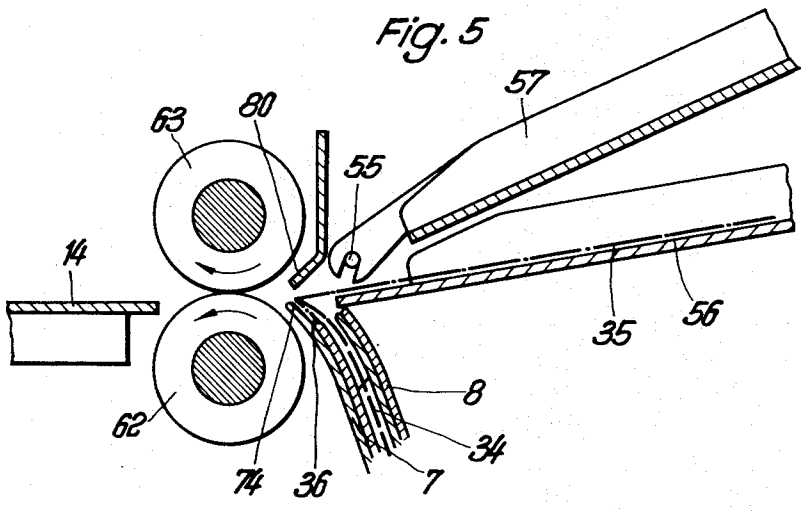
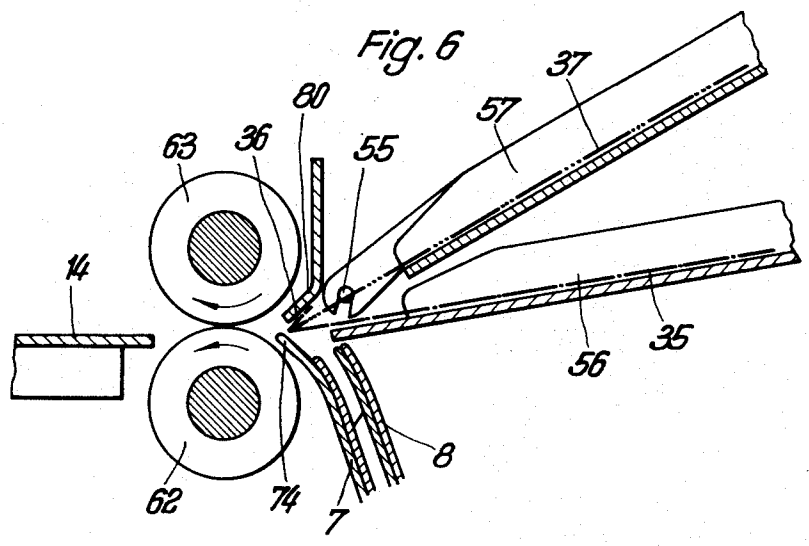


Fig. 6



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United States Patent Office 3,139,808 Patented July 7, 1964

3,139,803

METHOD AND APPARATUS FOR MAKING PRINTING FORM SHEETS

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Filed Apr. 25, 1961, Ser. No. 105,321
Claims priority, application Germany Apr. 29, 1960
4 Claims. (Cl. 95—73)

The present invention relates to a method and apparatus for making printing form sheets, particularly hectographic printing forms. The method and apparatus are particularly suited for making printing forms of photographic negatives.

In accordance with a known method for making printing forms, a foil or sheet is coated with a gelatin emulsion containing a silver halide. When this light-sensitive coating is exposed by projecting thereon a positive image, and then developed, a negative image, consisting of unhardened gelatin is formed in the emulsion, while the unexposed portion of the emulsions are hardened by the developing process. The unhardened gelatin image is brought into contact with a transfer sheet, for example a hectographic inked sheet, whereupon pressure and heat is applied. When the inked transfer sheet and the base sheet of the negative are separated, the unhardened image adheres to the transfer sheet and is transferred to the same, while the hardened gelatin remains on the base sheet of the negative. The transfer sheet carrying the negative gelatin image is brought into contact with a printing form sheet, which may consist of paper, metal or a synthetic material, and after about one minute, the printing form sheet is separated from the transfer sheet. The gelatin adheres to the printing form sheet, and separates from the transfer sheet, together with the inked layer of the same which also adheres to the gelatin negative, so that an inked negative image is transferred to the printing form sheet.

When a printing form is made in this manner, the difficulty arises that the respective two sheets, namely on one hand the negative and transfer sheet, and on the other hand the transfer sheet and the printing form sheet, must be brought into contact in an exactly aligned position, and directly before they are compressed by pressure rollers. An irregular contact between two sheets would cause wrinkling of one or both sheets. It is particularly important that the contact between each pair of sheets takes place only when the two sheets exactly register along their edges, since the arrangement of the text or of a picture on the newly made printing form must be exactly the same as the corresponding arrangement of the positive which is to be reproduced, or at least must be in a certain proportion thereto.

It is one object of the present invention to provide a simple and efficient apparatus capable of performing all operations required for making a printing form sheet from a photographic negative.

Another object of the invention is to provide an apparatus and a method for making printing form sheets in which the text or picture is arranged on the printing form sheet in the same manner as it was arranged on the positive which is to be reproduced.

Another object of the present invention is to provide a method for accurately aligning two sheets, for example a negative and a transfer sheet, or a transfer sheet and a printing form, in superimposed positions.

Another object of the present invention is to provide an apparatus for successively superimposing accurately aligned portions of two sheets, for example a negative and a transfer sheet, or a transfer sheet and a printing form sheet.

Another object of the present invention is to provide an apparatus in which all operations necessary for the making of a printing form sheet can be successively performed in a foolproof manner without requiring any experience of the operator.

With these objects in view, one embodiment of the apparatus of the invention comprises a first guide means for a first sheet having a first outlet portion; a second guide means for a second sheet and having a second outlet portion located in close proximity to the first outlet portion; and transporting pressure roller means located adjacent to the first and second outlet portions.

A tank for a developing liquid is provided, and a third guide means for guiding a third sheet passes through the tank and has a third outlet portion located in close proximity with the second outlet portion and adjacent to the roller means.

The third sheet may be a negative having a developable coating which is developed in the tank. The developed negative is either superimposed on a transfer sheet passing over the outlet portion of a second guide means and pressed against the same by the pressure roller means, or is transported by the pressure roller means onto a guide member and toward other pressure rollers to be superimposed on a transfer sheet guided by fourth guide means before being pressed against the same by the pressure rollers.

In any event, the negative unhardened image is transferred to the transfer sheet, and if a printing form is supplied to the first guide means, and a transfer sheet to the second guide means, the transporting and pressure roller means superimpose the transfer sheet and the printing form sheet so that the inked image is transferred to the printing form.

Due to the fact that the outlet portions of the various guide means terminate in close proximity to each other and substantially in the bight of the respective pressure roller means, successive portions of the respective sheets are superimposed, and pressed against each other.

The alignment is particularly accurate, if one of the sheets, for example the transfer sheet is provided with a leading edge portion folded over along a fold line to form a flap. The respective other sheet, for example the printing form sheet, or the negative, is guided along its guide means at an angle to the transfer sheet, and in such a manner that its leading edges passes under the flap and abuts the fold line. In this manner, the leading edges of the two sheets are exactly aligned so that successive portions of the sheets can be superimposed and pressed against each other while the edges of the sheets exactly register.

In view of the above, it will be understood that the present invention relates to a method of making a printing form which comprises the steps of moving along a first path a sheet having a leading edge portion folded over along a fold line to form a flap; moving another sheet along a second path crossing the first path so that the leading edge of the other sheet passes under the flap and abuts the fold line; and pressing together the successively superimposed aligned portions of the two sheets.

In one embodiment of the invention, the guide means for the printing form, the guide means for the transfer sheet, and the guide means for the negative are disposed in angularly displaced positions and have outlet portions which are located directly adjacent each other and in the bight of pressure roller means. During a first operation, the negative and transfer sheet are run through the machine, and during a second operation, the transfer sheet and the printing form are run through the machine. Each pair of sheets is pressed together by the pressure roller means. In order to permit easy access to the guide means of the transfer sheet, the guide means

for the printing form is mounted for turning movement into a position spaced in greater angular distance from the guide means of the transfer sheet. The guide means for the transfer sheet is preferably shiftable to a position retracted from the pressure roller means, which again facilitates the insertion of the transfer sheet.

It is important that the operator can place his hand near the outlet portions of the guide means, since the transfer sheet is somewhat moist after having been separated from the negative, and consequently has a tendency to warp and form waves.

In another embodiment of the invention, the negative runs through the pressure roller means during the first operation, but is not combined with a transfer sheet at this point. Another guide means is provided for the transfer sheet which has an outlet portion extending to another pair of pressure rollers by which the negative and the transfer sheet are pressed together. The transfer sheet is then separated from the negative, and the printing form on the transfer sheet are run through another pair of guide means which terminate at the first mentioned pair of roller means. A guide member is provided behind such first pair of roller means to guide the superimposed sheets to a discharged position.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a longitudinal sectional view of one embodiment of the invention;

FIG. 2 is a plan view of the embodiment shown in FIG. 1;

FIG. 3 is a longitudinal sectional view of another embodiment of the invention;

FIG. 4 is a plan view of the embodiment shown in FIG. 3;

FIG. 5 is a fragmentary longitudinal sectional view of a detail of FIG. 3 shown on an enlarged scale; and

FIG. 6 is a fragmentary view corresponding to FIG. 5 but showing another operational step.

Referring now to the drawings, and more particularly to FIGS. 1 and 2, a base plate **1** supports two walls **2** and **3**, and a detachable housing **4** including two side walls and a top part. A tank **5** containing a developing liquid **6** is detachably mounted on supporting brackets of base plate **1**. The top part of housing **4** carries a transparent supporting plate **40** of semi-circular configuration which extends about a lamp **42**. A flexible cover **41** can be pressed against the top face of supporting member **40**, and is opaque. A sheet carrying a light sensitive emulsion can be pressed by cover **41** against supporting means **40**, and exposed. Guide means **10**, **11** and **13** and input guide **9**, and an output guide **14** are mounted on housing **14**. A motor **15**, controlled by a switch **15***a*, is mounted on base **1**. A pair of input transporting rollers **17**, **18**, a pair of transporting pressure roller means **19** and **20**, and a pair of transporting pressure rollers **21** and **22** are mounted on lateral walls **2** and **3**. A guide means comprising a pair of spaced grid members **7** and **8** extends between the pair of rollers **17** and **18** and a pair of rollers **19** and **20** and through the tank **5**. A guide member **12** has an input portion located adjacent rollers **19** and **20**, and an output portion located adjacent the output portion of guide means **13** and in the region of the rollers **21** and **22**. Motor **15** drives through belt and pulley means **16**, **24**, **25**, **26**, **27** the rollers **18** and **20**, and through belt and pulley means **28**, **29** the roller **22**.

Roller **22** is connected to a gear **32** and drives roller **21** through a meshing gear **33**. Rollers **19** and **20** are connected by meshing gears **30** and **31**.

Roller **22** is provided with an inner electric heating resistance **23**.

The outlet portions of the guide means **7**, **10** and **11** extend at acute angles to each other. The guide member **12** extends at an acute angle to the guide means **13**. Behind the pair of transporting pressure roller means **19**, **20** a guide member **38** is mounted for turning movement between the position illustrated in solid lines, and the retracted position shown in broken lines. A sheet transported by the roller means **19**, **20** will be discharged in upward direction when guide member **38** is in the position shown in solid lines. When the guide member **38** is retracted, a sheet transported by roller means **19**, **20** will pass onto the guide member **12** and move toward the rollers **21**, **22**. Guide member **38** is operated by lever **39**.

This apparatus is operated as follows:

A foil **34** having a light-sensitive coating is placed with its coating in contact with the image side of a positive original, and pressed against the semi-circular support **40** by the cover **41** which is an elastic, flexible, opaque blanket. Lamp **42** is switched on by switch **43**, so that the light sensitive emulsion is exposed. Lamp **42** is switched off, the exposed negative removed, and separated from the positive. Thereupon motor **15** is started so that all rollers start to rotate, and the electric heating resistance **23** is connected until roller **22** is warm.

The exposed negative **34** is placed on the inlet guide **9** with its coating facing upward, and is transported by transporting rollers **17** and **18** into the guide means formed by the grids **7**, **8** so that the negative is developed by the developing liquid **6** in tank **5** whereby the parts of the exposed image remain soft, while the other parts of the negative are hardened by the liquid **6**. A transfer sheet **35** having an inked layer is placed on guide means **13** with the inked layer facing down. Transfer sheet **35** has a folded-over edge portion **36** on the side provided with the inked layer. Guide means **13** and guide member **12** are arranged at an angle to each other so that the fold line of the folded-over edge portion **36** is located in the plane of the guide member **12**. The guide member **38** is retracted to the position shown in broken lines, and when the negative **34** is transported by the roller means **19**, **20**, it moves along guide member **12** until its leading edge passes between the folded-over edge portion **36** and the main portion of the transfer sheet **35** and abuts the fold line at the leading end of a transfer sheet. The transfer sheet is thus pushed into the bight of roller means **21**, **22** which superimpose, press together and transport successive leading portions of the transfer sheet and of the negative in an exactly aligned and registering position. Due to the pressure between the heated roller **22** and roller **21**, the unhardened parts of the gelatin emulsion coating of the negative **34** are transferred to the transfer sheet and adhere to the same. The superimposed sheets are discharged to guide means **14**, and the operator separates the two sheets. After separation, the unhardened parts of the gelatin emulsion adhere to the transfer sheet, while the hardened portions remain on the foil base of the negative **34**.

The transfer sheet with the image thereon is now placed on guide means **10** with its folded-over edge portion **36** facing upward so that the fold line thereof is located in the plane defined by the guide means **11**. A printing form sheet **37** is placed on the guide means **11**, and advanced until its leading edge passes between the folded-over edge portion **36** and the main portion of the transfer sheet, and abuts the fold line of the transfer sheet **35**. Immediately thereafter, pressure roller means **19**, **20** grip the leading superimposed portions of the two sheets, and superimpose successive leading portions of the printing form of a transfer sheet. Before this operation, guide member **38** has been placed in the position shown in solid lines so that the superimposed sheets **34** and **35** are discharged in upward direction, as indicated in FIG. 1. When the two sheets are completely discharged, they are separated, and now the negative image, together with an inked coating which separates from the trans-

fer sheet, adheres to the printing form. In this manner, the printing form has now the desired and colored image.

The embodiment shown in FIGS. 3 to 6 is structurally different, but capable of carrying out the same method as the embodiment of FIGS. 1 and 2.

A base plate **1** supports a pair of walls **2** and **3** which are connected by rods **45** and **46**. A support **47** is secured to walls **2** and **3** which are fixedly connected to base plate **1**. A substantially U-shaped housing **48** is detachably mounted on base plate **1** and has openings for the guide means by which sheets are supplied and discharged to the operators.

The support **47** supports a tank **5** with a developing liquid. A guide means comprising a pair of grid members **7** and **8** which advantageously consist of a synthetic material, or of a stainless steel, passes through tank **5** and has an outlet portion located in the proximity of a pair of transporting and pressure roller means **62** and **63** and outside of tank **5**. The inlet portion of guide means **7**, **8** is located in the region of a pair of feeding rollers **60** and **61**. An inlet guide means **9** has a pair of lateral walls and an outlet portion in the form of a feeding hopper for guiding a negative **34** toward feeding rollers **60**, **61**. Guide means **9** has a pair of arcuate brackets resting on pins **32** fixed on the side walls **2** and **3**. A second guide means **56** has lateral guide brackets **77** provided with slots into which pins **54** project. The inlet end of guide means **56** has cam means **78** resting on guide pins **79**. Consequently, guide means **56** can be retracted from the illustrated position in which its outlet portion is located in close proximity to the outlet portion of guide means **7** and to the bight of transporting pressure roller means **62**, **63**.

A third guide means **57** is arranged angularly spaced from guide means **56**, and has forked brackets turnably mounted on pin means **55**. A lever **76** is mounted on a pin **53** and has recesses for engaging a pin **75** on guide means **57**. When guide means **57** is pivoted to the higher position shown in dash and dot lines, it can be arrested by another recess in lever **56**.

A discharge guide member **14** is arranged on the output side of roller **62**, **63**. Motor **15** drives a pulley **16** which drives pulleys **65** and **66** through a belt **64** to turn roller **62**. Another belt **67** connects pulley **66** with a pulley **68** secured to the shaft of roller **60**. A switch **73** controls the motor **15**.

An exposed negative **34** is placed in the inlet guide member **9** with its emulsion facing upward, and guided through the hopper portion of guide **9** to the transporting rollers **60**, **61**, which transport the negative **34** through the guide means **7**, **8** so that the negative is developed, and the unexposed portion hardened. As best seen in FIG. 5, a transfer sheet **35** having a bent-over leading edge portion **36** is placed on guide means **56** in a position in which it extends across the guide means **7**, **8**. The leading edge of the developed negative passes below flap **36** and abuts the fold line of transfer sheet **35** so that the same is pushed past a guide **80** into the bight of the transporting pressure roller means **62** and **63**. The insertion of the transfer sheet **35** into guide means **56** is facilitated by retracting the guide means **56**, and by pivoting guide means **57** to the higher position shown in broken lines in FIG. 3. This permits the operator to place her hand close to the outlet portion of guide means **56** and to properly arrange the leading portion of the transfer sheet.

The arresting lever **76** secures the guide means **57**, and is held in its arresting position by a spring **81** secured thereto and abutting a stop **82**.

When the transfer sheet **35** is pressed against the negative **34** by the pressure roller means, the unhardened image is transferred from the negative to the transfer sheet, and when the two superimposed sheets are discharged over outlet guide **14**, they can be separated with

the image adhering to the transfer sheet **35**. Roller **62** may be heated as described with reference to roller **22** of the embodiment of FIG. 1.

Switch **73** is operated to stop motor **15**, and the rollers.

The separated transfer sheet is now again placed on guide means **56** which may be retracted during insertion, while guide means **57** may be raised. The folded-over edge portion **36** is this time arranged in an upwardly projecting position, as shown in FIG. 6. A printing form sheet **37** is placed on guide means **57** after the same has been lowered to its normal position, and when the printing form sheet **37** is advanced, its leading edge engages the fold line between flap **36** and the main portion of transfer sheet **35**, and pushes the transfer sheet past the guides **80** and **74** into the bight between rollers **62** and **63** which grip, superimpose, press together, and transport successive portions of the superimposed sheets until the same are discharged over outlet guide **14**.

During the movement through the transporting rollers **62**, **63**, the leading edges are aligned, and the sheets register in a desired position.

When the discharged sheets are separated, the printing form carries the inked image which adheres thereto, and thus the operation is completed.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of methods and apparatus for making printing forms differing from the types described above.

While the invention has been illustrated and described as embodied in a method and apparatus for exactly aligning a transfer sheet with other sheets during the making of the printing form, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. An apparatus of the type described, comprising, in combination, a first guide means for a first printing form sheet and having a first outlet portion; a second guide means for a second transfer sheet, said second guide means being spaced from said first guide means and having a second outlet portion located in close proximity to said first outlet portion; and transporting pressure roller means located adjacent to said first and second outlet portions so that portions of said first and second sheets located between said first and second outlet portions and said roller means are superimposed, pressed against each other and transported by said roller means; a tank for a developing liquid; a third guide means for guiding a third light-sensitive sheet having a developable coating through said tank and having a third outlet portion located in close proximity with said second outlet portion and adjacent to said roller means; a pair of pressure rollers located spaced from said roller means, one of said rollers including heating means; a guide member extending between said roller means and said pressure rollers and having an inlet portion for receiving a third sheet transported by said roller means and an outlet portion for supplying the third sheet to said pressure rollers; a fourth guide means for said second sheet and having a fourth outlet portion located in close proximity with said outlet portion of said guide member so that said

pressure rollers superimpose portions of said second and third sheets, press the same against each other, and transport the same.

2. An apparatus of the type described, comprising, in combination, a first guide means for a first printing form sheet and having a first outlet portion; a second guide means for a second transfer sheet, said second guide means being spaced from said first guide means and having a second outlet portion located in close proximity to said first outlet portion; and transporting pressure roller means located adjacent to said first and second outlet portions so that portions of said first and second sheets located between said first and second outlet portions and said roller means are superimposed, pressed against each other and transported by said roller means; a tank for a developing liquid; a third guide means for guiding a third light-sensitive sheet having a developable coating through said tank and having a third outlet portion located in close proximity with said second outlet portion and adjacent to said roller means; a pair of pressure rollers located spaced from said roller means, one of said rollers including heating means; a guide member extending between said roller means and said pressure rollers and having an inlet portion for receiving a third sheet transported by said roller means and an outlet portion for supplying the third sheet to said pressure rollers; a movable guide located on the side of said roller means remote from said first and second guide portions and having a first position for discharging superimposed first and second sheets, and a second position for guiding the third sheet onto the inlet portion of said guide member; a fourth guide means for said

second sheet and having a fourth outlet portion located in close proximity with said outlet portion of said guide member so that said pressure rollers superimpose portions of said second and third sheets, press the same against each other, and transport the same.

3. An apparatus as set forth in claim 2 and including means for supporting said third sheet; and illuminating means for exposing a third sheet located on said supporting means.

4. An apparatus as set forth in claim 3 wherein said supporting means is a transparent plate of semicircular configuration; and wherein said illuminating means is a lamp located at the center of curvature of said transparent plate.

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