Dec. 5, 1961 H. J. THOMISZER 3,012,141

HEATING APPARATUS

Filed Aug. 18, 1960

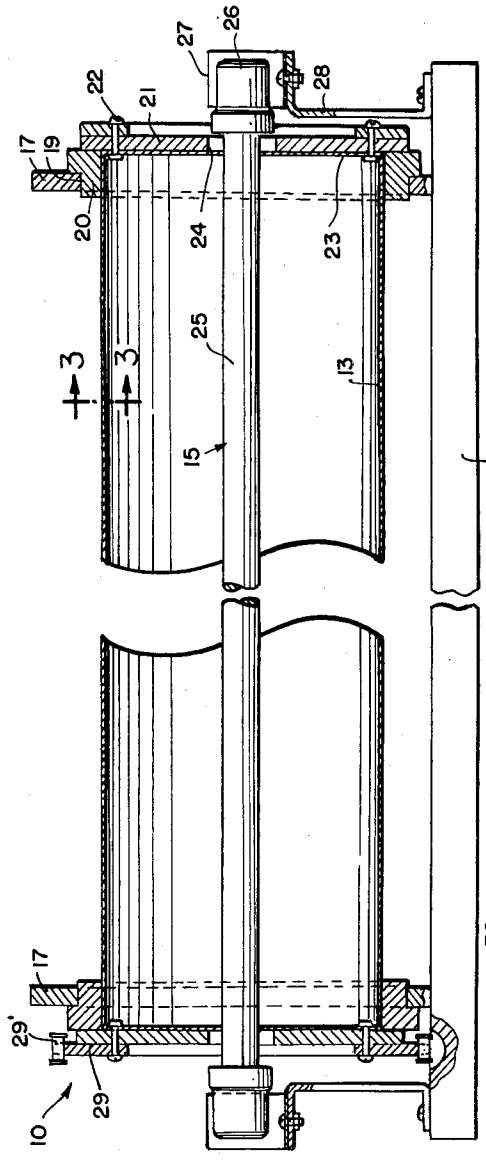


FIG. 1

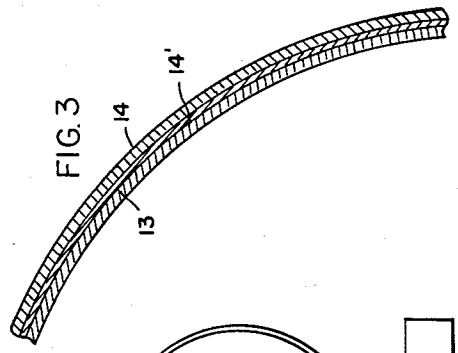


FIG. 3

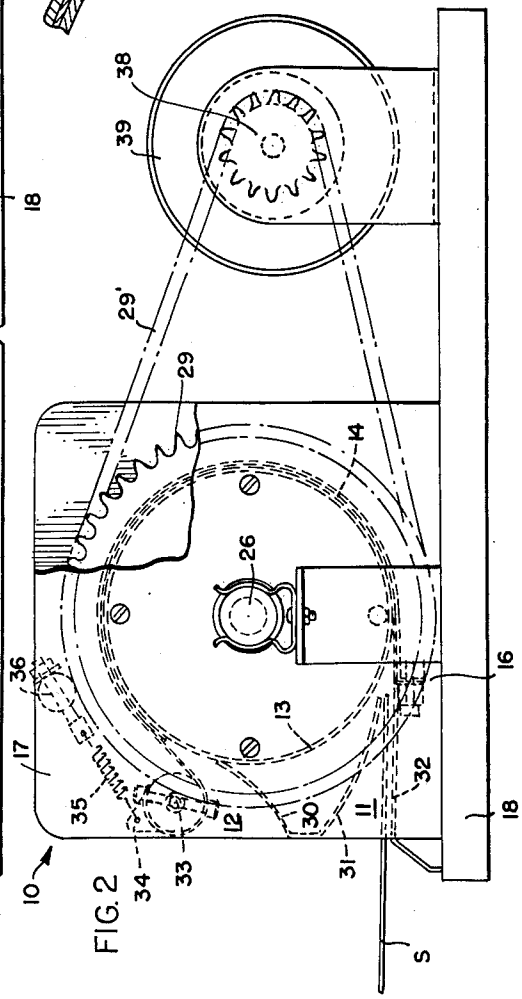


FIG. 2

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United States Patent Office 3,012,141 Patented Dec. 5, 1961

3,012,141

HEATING APPARATUS

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Filed Aug. 18, 1960, Ser. No. 50,527
15 Claims. (Cl. 250—65)

The present invention relates in general to the art of copying graphic material, such as typewritten and other written or printed material, sketches, tracings, drawings, photographs, memoranda and the like.

The production of copies of original graphic material commonly involves the exposure of a copying sheet of radiation sensitive material, to the action of rays to which the sheet is sensitive, in the presence of the original material to be copied, and the treatment of the sheet, as with developing liquids, in order to produce a visible image in the sheet reproducing the original graphic material, the treatment of the sheet with developing liquids being messy and time consuming.

An important object of the present invention is to eliminate the necessity of using liquid developers in making copies of graphic material; a further object being to produce copies in developed condition merely by heating the sensitive copying material to develop the same as a print.

The invention has particular reference to the production of copies by the diazotype process which is based upon the circumstance that diazo compounds will decompose, when exposed to the action of ultraviolet light, to produce materials which are and which thereafter remain essentially colorless, together with the further circumstance that the remaining diazo compound may be combined with other essentially colorless materials, called couplers, to produce intense azoic dyes which are insensitive to light and hence capable of forming permanent visible images. As a consequence, diazo compounds together with coupling substances may be dissolved in water which has been weakly acidified as by means of citric, tartaric, or boric acids; and auxiliary chemical compounds may also be dissolved in the water, along with the acidic, diazo and coupling components, to yield a light sensitive coating solution which may then be applied upon a sheet of material, such as paper, and dried to remove only the water component. When such a sheet is exposed to the action of ultraviolet light, through a layer of material that is transparent to such light, and which carries opaque images thereon, the diazo compound in the coating may be destroyed except where screened by the opaque images of the original to be copied. Thereafter, by placing the exposed sheet in an alkaline environment, such as ammonia vapor, or by immersing it in an aqueous solution of ammonia, the coupling component may be caused to combine with the remaining diazo compounds to convert the same to a permanent dye forming an exact reproduction, in the sheet, of the light opaque image-forming portions of the original.

Another important object of the present invention is to provide for the production of diazotype prints by merely heating the exposed print forming material, in order to produce ammonia gas therein and thus develop permanent dye images therein, thus greatly simplifying and expediting the production of prints.

Another important object of the invention is to utilize print forming sheet material having print developing substances incorporated therein, in a form adapted for activation when heated, so that the material merely requires heating for the development of visible images in permanently visible condition therein.

Another important object is to provide for the development of permanently visible images in an exposed diazotype sheet of sensitized material by applying heat to

the exposed sheet in order to produce ammonia vapors as an alkaline environment for the development of the diazotype images in the sheet.

Another important object of the present invention is to provide improved apparatus for applying heat to a sheet of material substantially uniformly in all portions of the sheet; a further object being to provide improved means for heating an exposed sheet of sensitive copying material, in order to produce a facsimile of graphic material contained in a master or original, without having to immerse the copying sheet in a liquid developing solution after exposure for the development of copy images therein.

Another important object of the invention is to provide improved means for heating a sensitive copying sheet at a temperature sufficient to release a developing gas, such as ammonia, from a substance such as urea, contained in the sheet, to thereby develop a highly visible and stable image in the sheet; a further object being to provide a heater through which the sheet may be delivered rapidly and at a uniform rate of speed, to thereby heat transversely extending sections of the sheet, successively and at a rapid and uniform rate of speed, throughout its entire length, so that sheets of relatively large area may be uniformly heated in apparatus of relatively small size; a still further object being to utilize a heating roller of relatively small diametral size, of the order of three inches or less, for sheet heating purposes; a further object being to form the heating roller as a cylindrical sleeve of metal in conjunction with means for continuously rotating the sleeve while passing the sheet to be treated around and in surface contact therewith, a heater being mounted within the sleeve in order to heat the same to a desired temperature; yet a further object of the invention being to form the sleeve as an aluminum tube having a black coating upon the inner surface thereof and an outer coating of any desired color other than black; still another important object being to utilize an elongated tubular infrared ray lamp as a means for heating the sleeve, said lamp being preferably mounted in stationary position coaxially within the rotatable sleeve of the sheet treating apparatus.

Another important object is to provide sheet flattening means for removing the curvature which is normally imparted in sheet material while travelling around a heated roller, especially a roller of small diameter; a further object being to provide a scraper blade for separating the sheet from the heating roller, said blade having reverse curvature of the order of that of the heating roller, whereby to impart a sheet straightening effect in the sheet while it is still in warm condition as delivered from the heating roller.

Another important object is to provide for retaining a sheet of sensitive copying material upon a heating roller by means of a stationary belt embracing the roller and against which the roller is turned, the belt being suitably anchored upon a stationary support at one end, while its other end is connected with elastic means, such as a spring, to thereby yieldingly hold the belt in contact with the surface of the heating roller; a further object being to form the belt as a fiber glass fabric sheet impregnated with Teflon plastic; a still further object being to provide the roller engaging surface of the belt with a lining comprising a layer of pure Teflon plastic.

Another important object is to provide for transporting a sheet of material between a stationary sheet guiding member, such as a relatively stationary guide belt, and a moving sheet transport member, such as a relatively turnable sleeve movable against the belt, in order to draw or traverse sheet material, between the relatively moving and relatively stationary members, from a sheet receiving to a sheet discharging station.

The foregoing and numerous other important objects,

advantages and inherent functions of the invention will become apparent as the same is more fully understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment of the invention.

Referring to the drawings:

FIG. 1 is a sectional view taken longitudinally through sheet transporting and treating apparatus embodying the present invention;

FIG. 2 is an end view of the apparatus shown in FIG. 1; and

FIG. 3 is an enlarged sectional view taken substantially along the line 3—3 in FIG. 1.

To illustrate the invention, the drawings show transporting apparatus **10** for conveying sheet material S along a selected path between sheet receiving and sheet delivery stations **11** and **12**. The sensitive sheet material may comprise a web, as of paper or other suitable sheeting, having a ray sensitive composition coated thereon, said sensitive composition being convertible to stable, colorless condition upon exposure to radiation containing ultraviolet rays, either alone or in combination with other radiation, including visible light rays, said composition being also convertible to highly visible, inert and stable condition upon exposure to heat at temperatures of the order of 300° F. While the sensitive coating may comprise any suitable substance having the foregoing characteristics, a diazo compound and an azo dye coupling component, together with a substance, such as urea, which produces an alkaline diazo developing reaction when heated at temperatures of the order of 300° F., may be used in the manner taught in the copending application of Klimkowski, Beauchamp and Bauer for United States Letters Patent on Diazotype Reproduction Material, filed February 1, 1960, Serial No. 5,688, no claim being herein made for the ray sensitive copy sheet per se.

In making a copy of an original or master having imprinted or otherwise applied thereon graphic markings or characters embodying material capable of absorbing ultraviolet radiation, a sensitized copy sheet S may be stacked with the original or master to be produced to form an exposure sandwich adapted for disposition in a photographic exposure station or zone in position to expose the light sensitive material to ultraviolet rays applied thereto through the original or master to be copied. Latent images corresponding with the graphic markings or characters of the original, may thus be produced, in the sensitive material S, as a result of the diazo destroying or inactivating action of the radiation on all portions of the sensitive sheet S except such portions thereof as are screened by the characters or graphic markings of the original. The latent images thus formed in the copying sheet S may then be stabilized and converted to permanently visible condition by heating the copying sheet at a temperature of the order of 300° F. to thereby evolve ammonia gas as the result of the decomposition of the urea in the sheet. As a consequence of heating the exposed copying sheet, the latent image areas therein may be converted to highly visible, stable condition thereby providing, in the developed sheet, permanent visible copy images corresponding with the graphic markings or characters of the master. For optimum developing efficiency, the master or original may be stripped from the copying sheet to allow the application of developing heat directly thereto.

The sheet transporting apparatus **10** preferably comprises a pair of relatively movable sheet guiding and moving components **13** and **14**, means being provided for heating at least one of the components in order to apply heat to a sheet of material as the same is transported between the components. To this end, a heater **15** may be provided for heating the component **13**. As shown, the heated component **13** may be formed as a continuously turnable cylindrical member, such as a sleeve of aluminum or other suitable heat conducting metal, while the component **14** may comprise a strip or web of material embracing and in contact with the peripheral surfaces of the sleeve which forms the component **13**. The strip of material or web forming the component **14** may be anchored at one end of a stationary support or clamp **16**, the opposite end of the web being connected with resilient means for snugly and yieldingly pressing the web upon and about the surfaces of the component **13**. The web preferably embraces surfaces of the sleeve subtending an angle of the order of 270°.

The cylindrical sleeve member forming the component **13** is preferably provided with a black coating upon its inner surface to constitute the same as a black body capable of absorbing heat readily from any heat source disposed within the sleeve, the outer surfaces of the sleeve **13** having any preferred coloration, other than black, in order to promote heat emission outwardly of the sleeve **13** and into any sheet material held upon the outer surfaces of the sleeve, as the same is turned within the web or belt element **14**. Where the sleeve **13** comprises aluminum, the black inner coating may be formed thereon as by means of the Sanford process, which process may also be employed to apply a hard oxide coating of desired color on the outer or web facing surface of the sleeve.

The component **14** may comprise any suitable heat resisting web material, but the same preferably comprises a fiber glass fabric element impregnated with Teflon or similar synthetic plastic material providing a heat resistant web of adequate strength. Since the surface of a woven fiber glass fabric sheet is not entirely smooth even when impregnated with Teflon, it is desirable to provide a sheet **14** with a lining or layer **14'** of pure Teflon or like plastic overlying the surface thereof which faces inwardly upon the sleeve **13**. As a consequence, sheet material introduced between the sleeve and the web, at the receiving station **11**, may travel thence between the outer surface of the sleeve **13** and the smooth sleeve facing surface of the pure Teflon lining **14'**, because of the frictional differential between the metal cylinder and the plastic belt. This lining, at one end, may be securely anchored on the clamp **16**, while its opposite end may extend to and float unanchored at the sheet delivery station **12**.

Teflon, and other plastic materials having like characteristics, is a good heat reservoir because of the low thermal conductivity of the material. It is also substantially impervious to the penetration of gas. Accordingly, it is well adapted for use in apparatus for transporting sheet material while exposing the same to the action of heat. The material, because of its impervious nature, is well able to retain, in the transported sheet, any and all gases that may be evolved therein during movement of the sheet between the web **14** and the sleeve **13**, which of course is also relatively impervious to gas penetration. As a consequence, the illustrated mechanism may be employed, in accordance with the specific aspects of the present invention, for the purpose of developing permanently visible images in sensitive sheet material, merely by heating it to evolve therein gases adapted to accomplish the desired image developing action, the relatively impervious sheet shifting components of the mechanism serving to retain such evolved gases in position enveloping the sheet to be treated as it travels along therebetween.

The foregoing print developing process may be carried out conveniently and expeditiously by means of apparatus of the sort herein disclosed, the same being particularly well suited for the desired purpose, since it is unusually compact and of simple construction. As shown, the apparatus comprises a stationary support structure embodying a pair of spaced apart end plates **17**, as of Bakelite or Formica, with glass or asbestos as a filler material, forming heat insulating bearing supports, said end plates being mounted on a suitable support base **18**,

in any suitable, preferred or convenient fashion. The end plates **17** may each be provided with circular openings **19** sized for the turnable reception of preferably Teflon plastic bearing sleeves **20** secured upon and at the opposite ends of the sheet transporting sleeve **13**, to thereby support said sleeve turnably on the end plate **17**. Heat insulating shields in the form of end plates **21**, as of Bakelite, Transite or other heat resistant material, may be secured to the opposite ends of the sleeve **13**, as by means of fastening studs **22** penetrating said plates and inwardly turned peripheral mounting flanges **23** formed on the opposite ends of the sleeve **13**.

In alignment with the axis of the sleeve **13**, the end plates **21** may be formed with central perforations **24** sized to permit the insertion therethrough of the heater **15**, which preferably comprises an elongated tubular infrared ray lamp **25** of conventional construction, the same conveniently comprising a tubular quartz lamp of the sort identified as No. T–3, manufactured by General Electric Company, the same having a color temperature of 2400° K. The opposite ends of the infrared ray lamp may extend outwardly of the heat shields **21**, such outwardly extending lamp ends having electrodes **26** fitted thereon in position for reception in clips **27**, which may be supported on brackets **28** on the base **18** in position to mount the infrared ray lamp **25** in position extending coaxially within the sleeve **13**. The lamp mounting clips **27** may be electrically connected in external lamp energizing circuitry. While and so long as the lamp **25** is appropriately energized for operation as an infrared ray emitter, the resulting irradiation will be applied upon the inner black coated surface of the sleeve **13**, which will absorb substantially all of the radiation emitted by the lamp. Such absorbed radiation will result in heating the sleeve **13** substantially above the critical temperature required to produce ammonia by the decomposition of urea.

In order to rotate the sleeve **13** within the embracing web or belt **14**, and thus transport sheet material S from the receiving station **11** to the delivery station **12**, any suitable means may be provided for turning the sleeve, preferably at an adjustable, uniform rate of speed. As shown, a sprocket wheel **29** may be secured upon and outwardly of a heat shield **21**, at one end of the sleeve **13**, and a chain **29'** may be employed to drivingly connect the sprocket with a driving pinion **38**. The pinion in turn may be drivingly connected with a suitable motor, such as an electrical motor **39**, which may be supported on and secured to the base **18**. Suitable motor control means of conventional character may, of course, be provided for starting and stopping the motor and for regulating its speed in order to determine the rate of travel of sheet material S around the sleeve **13**, between the receiving and delivery stations **11** and **12**.

An important feature of the present invention resides in the provision of heat treating equipment of the character described, in which the sleeve **13** is of minimal size, the same preferably having a diameter of the order of three inches or less, whereby the entire apparatus is unusually compact, it being possible to provide a serviceable heater embodying a sleeve of diameter as small as one inch. Where sheet material is delivered around a heated roller of the relatively small size contemplated herein, the sheet tends to receive curvature of the order of that of the sleeve, so that the material as delivered at the station **12** embodies a tight curl. The present invention contemplates the provision of means for eliminating such curling tendency by providing, at the delivery station, a scraper blade **30** defining one side of the delivery station **12** and having an edge adapted to ride upon the surface of the sleeve **13** in order to separate sheet material from the sleeve and guide it into the delivery zone **12**, said blade **30** having reverse curvature of the order of that of the roller sleeve **13**. As a consequence, a curled sheet, as delivered from the heated sleeve **13**

and while still warm, will be subjected to the reverse curling action of the blade **30** to an extent substantially equal to the curvature imparted thereto by the sleeve **13**. As a consequence, the sheet will be straightened out and allowed to cool in substantially flat condition.

As shown more particularly in FIG. 2 of the drawings, the sheet uncurling blade **30** may comprise a formed sheet metal member. The sleeve remote side of said blade may be rebent and extended as at **31** to define one side of the sheet receiving station **11**. The opposite side of said station **11** may be defined by a suitably formed sheet metal element **32** having an inner end extending at the belt clamp **16**. Sheet material S to be treated may be delivered between the guide members **31** and **32** and thence between the sleeve **13** and the anchored end of the belt **14**. The opposite end of the belt **14**, at the delivery station **12**, may be wrapped upon and secured to a mounting roller **33** disposed above the scraper and uncurling blade **30**. The mounting roller **33**, in turn, may be supported in suitable bearings for limited tilting movement and may have a radial arm **34** adapted for connection with an end of a preferably helical tension spring **35**. The opposite end of the spring may be connected upon an anchoring screw **36** adjustably mounted, as on one of the end plates **17**.

Suitable heat sensitive means, preferably a thermistor, disposed in position to sense the operating temperature of the sleeve **13**, may be provided in conjunction with preferably transistorized amplifying circuitry, connected to control the supply of operating energy to the heater **15**, whereby to maintain the operating temperature of the sleeve within desired limits.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the form herein disclosed being a preferred embodiment for the purpose of illustrating the invention.

The invention is hereby claimed as follows:

1. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, and heating means, including an infrared ray lamp, operable to heat a sheet as it is transported between said sheet receiving and delivery stations.

2. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said sheet transporting members being capable of absorbing infrared rays, and an infrared ray lamp disposed in position to apply rays upon said absorbing member to constitute the same as a sheet heating element.

3. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding mem-

ber defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said cooperating members being capable of absorbing infrared rays and of conducting heat, while the other comprises heat insulating material, and an infrared ray lamp disposed in position to irradiate and thus heat said ray absorbing and heat conducting member for transfer of heat thence to a sheet to be heated between said cooperating sheet transporting members.

4. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of the cooperating members comprising a flexible belt anchored at its opposite ends in position forming a bight while the other comprises a sleeve turnable within the bight, and an infrared ray lamp disposed in position to irradiate and thus heat said sleeve for transfer of heat thence to a sheet to be heated.

5. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said cooperating members comprising a flexible belt anchored at its opposite ends in position forming a bight while the other comprises a sleeve of heat conducting material turnably mounted within said bight, and an infrared ray lamp disposed within said sleeve in position to heat the same.

6. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said cooperating members comprising a flexible belt anchored at its opposite ends in position providing a bight while the other comprises a hollow sleeve of heat conducting material having a black coating formed upon its inner surfaces, and a tubular infrared ray lamp mounted within the sleeve in position to irradiate the sleeve surface carrying said black coating.

7. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said cooperating members comprising a flexible belt anchored at its opposite ends in position providing a bight while the other comprises a hollow sleeve of aluminum having a black coating formed upon its inner surfaces, and a tubular infrared ray lamp mounted within the sleeve in position to irradiate the sleeve surface carrying said black coating.

8. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said cooperating members comprising a flexible belt of synthetic plastic anchored at its opposite ends in position forming a bight while the other comprises a sleeve of aluminum turnably mounted within said bight, and means for heating a sensitive sheet as it is transported by said members between said sheet receiving and delivery stations.

9. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said cooperating members comprising a flexible belt of woven glass fabric anchored at its opposite ends in position forming a bight while the other comprises a sleeve turnably mounted within the bight, a layer of synthetic plastic overlying the sleeve facing surface of said belt, and means for heating a sensitive sheet as it is transported by said members between said sheet receiving and delivery stations.

10. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said cooperating members comprising a flexible belt of a synthetic plastic impregnated woven glass fabric anchored at its opposite ends in position forming a bight while the other comprises a sleeve turnably mounted within the bight, and a layer of synthetic plastic overlying the sleeve facing surface of said belt, and means for heating a sensitive sheet as it is transported by said members between said sheet receiving and delivery stations.

11. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said cooperating members comprising a flexible belt anchored at its opposite ends in position forming a bight while the other comprises a sleeve turnably mounted within said bight, means for

heating a sensitive sheet as it is transported by said members between said sheet receiving and delivery stations, and sheet uncurling means disposed at said delivery station and comprising a blade extending along said sleeve and having reverse curvature of the order of that of the sleeve.

12. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a pair of cooperating sheet transporting members, including a relatively stationary sheet guiding member defining a sheet transfer path between sheet receiving and sheet delivery stations and a relatively shiftable member in sliding surface contact with the stationary member, means to move the shiftable member wipingly on the stationary member in a direction to transport sheet material, between the members, from the receiving station to the delivery station, one of said cooperating members comprising a flexible belt anchored at its opposite ends in position forming a bight while the other comprises a cylindrical sleeve turnably mounted within said bight and having a diameter of the order of three inches or less, and means for heating a sensitive sheet as it is transported by said members between said sheet receiving and delivery stations, said sheet heating means being disposed within said sleeve in position to apply heat therein for transfer thence to a sheet to be heated.

13. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a flexible belt of heat absorbing synthetic plastic anchored on a pair of spaced supports to form a relatively stationary sheet guiding member defining a sheet transfer path between spaced apart sheet receiving and sheet delivery stations respectively located at said supports, a relatively turnable metal sleeve in surface contact with a bight of the belt, between said supports, means to turn the sleeve wipingly on the belt in a direction to transport sheet material, from the sheet receiving station to the sheet delivery station, and an infrared ray lamp mounted coaxially within the sleeve and operable to constitute the same as a source of heat to develop a sheet as it is transported between said sheet receiving and delivery stations.

14. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a flexible belt of heat absorbing synthetic plastic anchored on a pair of spaced supports to form a relatively stationary sheet guiding member defining a sheet transfer path between spaced apart sheet receiving and sheet delivery stations respectively located at said supports, a relatively turnable metal sleeve in surface contact with a bight of the belt, between said supports, means to turn the sleeve wipingly on the belt in a direction to transport sheet material, from the sheet receiving station to the sheet delivery station, said turnable metal sleeve comprising aluminum with a black Sanford process coating formed upon the inner surfaces of the sleeve, and a tubular infrared ray lamp disposed coaxially within the sleeve in position to irradiate the sleeve surface carrying said black coating.

15. Apparatus for the development of a ray sensitive sheet containing heat activatable developing material, comprising a flexible belt of heat absorbing synthetic plastic anchored on a pair of spaced supports to form a relatively stationary sheet guiding member defining a sheet transfer path between spaced apart sheet receiving and sheet delivery stations respectively located at said supports, a relatively turnable metal sleeve in surface contact with a bight of the belt, between said supports, means to turn the sleeve wipingly on the belt in a direction to transport sheet material from the sheet receiving station to the sheet delivery station, said flexible belt comprising woven glass fabric carrying a layer of Teflon plastic overlying the sleeve facing surface of said belt, and an infrared ray lamp disposed coaxially within the sleeve.

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