United States Patent [19]

Davidson, Jr.

[11] **3,785,289**

[45] **Jan. 15, 1974**

[54] **COPIER-DUPLICATOR**

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[73] Assignee: **Robert C. Brown, Jr.**, Highwood, Ill. ; a part interest

[22] Filed: **July 31, 1972**

[21] Appl. No.: **276,718**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 115,502, Feb. 16, 1971, abandoned.

[52] **U.S. Cl.** **101/450,** 101/229, 101/425

[51] **Int. Cl.** **B41n 1/06,** B41f 35/06

[58] **Field of Search** 101/425, 450

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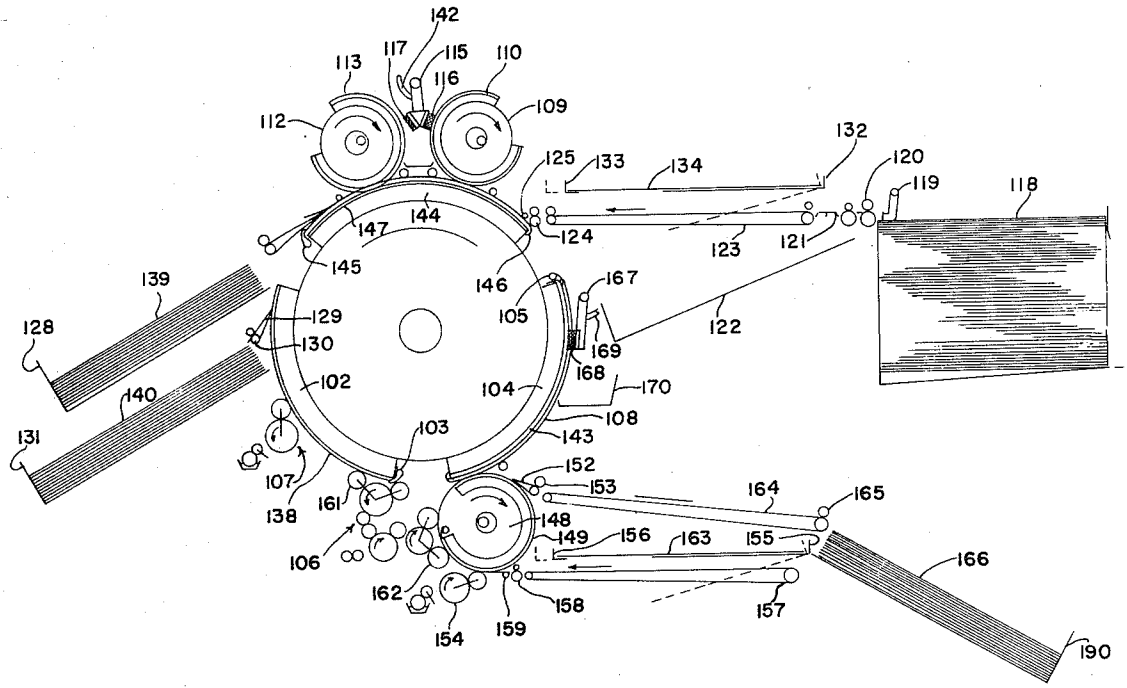
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[57] **ABSTRACT**

A method and apparatus for producing multiple high quality copies of each of a series of one or two sided originals on ordinary paper while obtaining maximum net production in terms of both the number of originals copied and the number of copies produced, wherein a first right reading offset lithographic master or pair of masters are produced by known means from one or both sides of a first original, processed, pre-wet and attached to the plate holding surface or surfaces of an offset lithographic duplicator which then produces the desired number of one or two sided copies of the first original, with the image or images on the master or pair of masters being dampened (if required), inked and then offset onto a first offset blanket of first pair of offset blankets from which said image or images are in turn offset onto one or both sides of ordinary copy paper. While these copies from the first original are being run, a second master or pair of masters are being produced from the second original, processed and pre-wet. When the desired number of one or two sided copies of the first original have been produced, the first master or pair of masters are ejected. The second master or pair of masters are then immediately attached to the plate holding surface or surfaces and the process repeated.

8 Claims, 4 Drawing Figures



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SHEET 1 OF 3

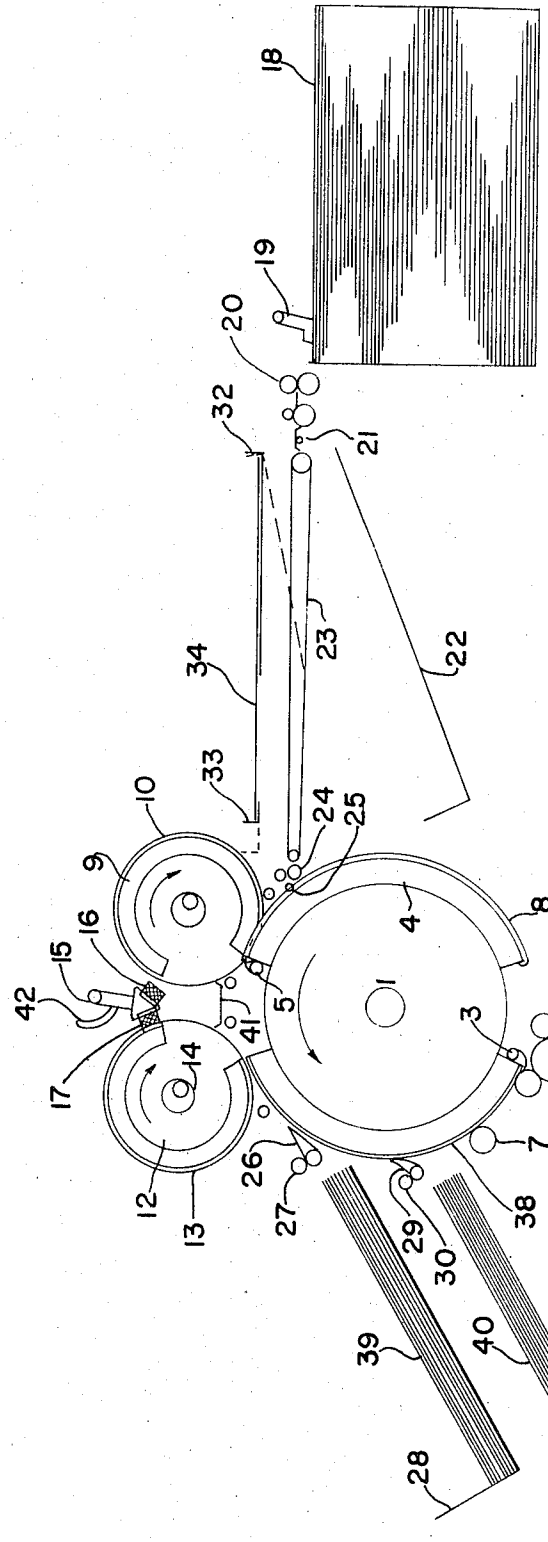


FIG-1

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ATTYS.

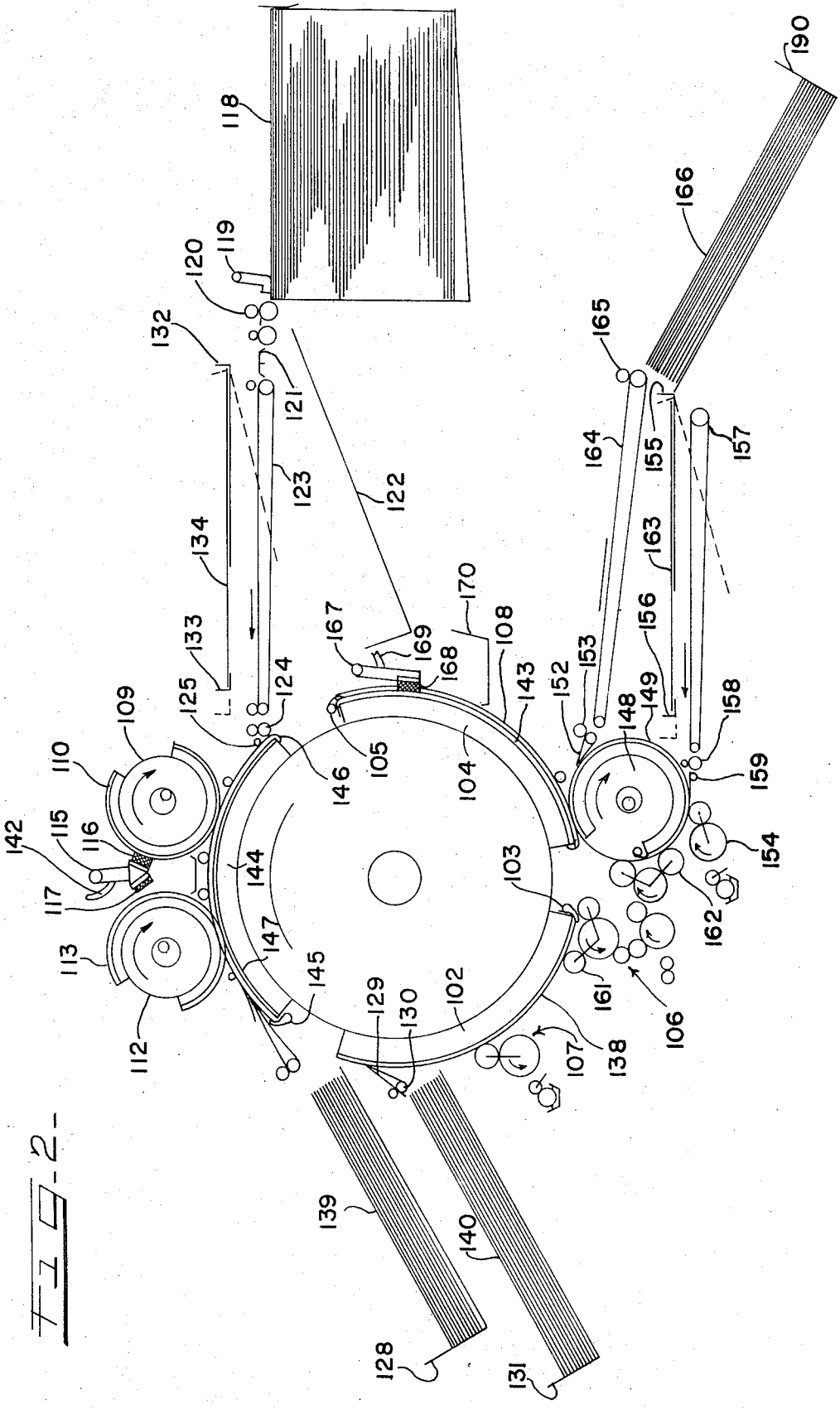

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FIG-2-

FIG-3-

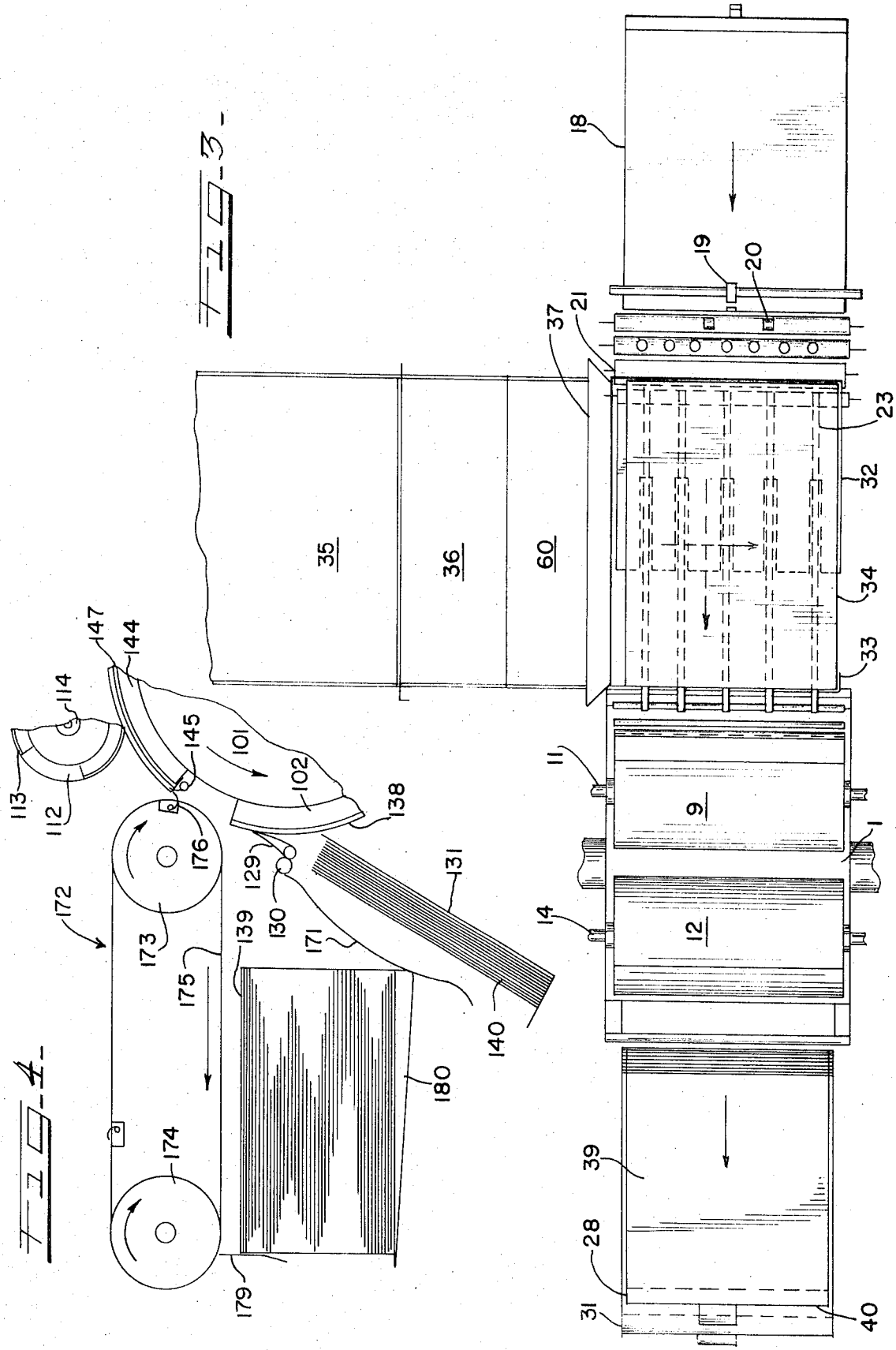

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FIG-4-

COPIER-DUPLICATOR

BACKGROUND OF THE INVENTION

This application is a continuation-in-part of copending application Ser. No. 115,502, filed Feb. 16, 1971, now abandoned.

As the market for copiers has grown and expanded, it has been found that copiers which can produce copies on any kind of ordinary copy paper are much preferred to copiers which are limited to producing copies only on specific copy sheets which have been previously treated or coated.

Originally the speed at which copiers would operate made it economically impractical to use them where more than 10 or a dozen copies of each original were required. More recently what are known as "copier-duplicators" have appeared which operate at higher speeds and which therefore are proving to be useful and economical where larger numbers of copies are desired from each original.

In addition, users of copiers and copier duplicators are demanding copies of better and more consistent quality.

Further, since many of the originals of which copies are made carry images on both sides of the sheet it is desired to produce copies which similarly have the two images which appear on the two sides of the original on the two sides of the copies produced.

A number of copiers exist on the market today which can produce copies of good quality but only on special copy paper which has been previously treated or coated and which cannot produce such copies at the speeds required to compete in the so-called "copier-duplicator" market. Many of these copiers can produce copies from either side of a two sided original and in turn many of these copiers can produce copies which in turn may be used as lithographic masters.

Copier-duplicators are being produced which utilize such copiers to produce a lithographic master from one side of either a one or two sided original and which include means by which the original is then ejected and said lithographic master is automatically processed, pre-wet and attached to the plate cylinder of a direct lithographic duplicator where the surface of the plate is then automatically dampened and inked, after which a preset number of copies of ordinary copy paper are fed through the direct lithographic duplicator and the image from the lithographic master printed directly on the surface of successive copy sheets which are then delivered into a hopper.

While these copies are being produced, another similar lithographic master is being produced, processed and pre-wet from another original. When the desired preset number of copies have been produced from the first lithographic master, it is automatically ejected into a separate receiving hopper and the second lithographic master is automatically attached to the plate cylinder of the direct lithographic duplicator and the process is repeated.

The image produced on the lithographic master by the copying device is a mirror image of the image appearing on the original and it is transferred directly from the surface of the master onto the successive sheets of copy paper where it appears as a right reading image which is a copy of the original.

The quality of the copy which can be produced by direct lithography wherein the image is transferred directly from the surface of the lithographic plate onto the copy paper is inferior to the quality which can be produced when the image from a right reading lithographic master is first offset onto a resilient off-set blanket (where it then appears as a mirror image of the original) and thereafter transferred from the surface of the resilient blanket onto the surface of the copy paper.

However, when the offset duplicating process is used, the residual image from the first lithographic master must be cleaned from the surface of the offset blanket before the image from a second lithographic master may be offset onto the surface of the blanket. While automatic blanket cleaners for performing this operation automatically are known, the time required for the blanket cleaning process is such that if an offset lithographic duplicator were used instead of a direct lithographic duplicator, the net production that could be obtained would be considerably reduced because of the time interval that would be required to clean the blanket after running one lithographic master before running the next one.

With the direct lithographic duplicator, there is no blanket to be cleaned and a second master may be attached immediately after the first one has been ejected.

With existing copier-duplicators of this type, if both sides of two sided originals are to be copied either one of two methods must be followed: In one case the copies that have been made of one side of a two sided original may be turned over and reinserted in the feeder for copy paper and then a copy of the other side of the original produced on the other side of the copy sheets. This is time-consuming and interrupts the rhythm of the process upon which net production depends when copies of a number of originals are being run successively. If copies are made of one side of a series of two sided originals and then all of the copies from all of these originals are turned over and reinserted into the feeder for copy paper and the second side of the originals then run through, it has been found as a practical matter to be extremely difficult to say the least to insure that all of the copies end up with the right images on the two sides thereof and for this reason this method is seldom if ever used as a practical matter.

A second method that may be used is to first produce copies of one side of a two sided original and then produce copies of the other side of the same original and to then staple the two sheets together back-to-back in each case to simulate the original with the copies in each case consisting of two sheets stapled together with one sheet being a copy of one side of the original and the other sheet being a copy of the second side of the original.

The method of the present invention makes it possible to produce copies of the higher quality which can be obtained through the use of an offset duplicator instead of a direct lithographic duplicator while eliminating the lost time required for the cleaning of the offset blanket before a second lithographic master may be attached and run.

The method and apparatus disclosed also provides means by which copies of a two sided original may be sumultaneously produced on the two sides of sheets of ordinary copy paper. In this case, too, the copies are produced by offset lithography, not by direct lithography and the waiting period for cleaning the blanket between the production of copies from different originals is also eliminated. It is thus possible by using the

method and apparatus of the present invention to produce high quality copies on ordinary copy paper from either one or two sided originals at high production speeds in terms of the number of copy sheets delivered per hour and also at high net production in terms of the number of different originals from which copies may be produced in a given period of time.

The attached drawings illustrate diagrammatically several alternative types of apparatus by which the method of the present invention may be performed.

FIG. 1 is a diagrammatic showing of apparatus by means of which a series of preprocessed and pre-wet right reading lithographic masters may be successively attached to the plate supporting surface of an offset duplicator and a predetermined number of offset copies produced on ordinary paper from each successive master. The apparatus of FIG. 1 will produce copies on one side of the copy paper at a time from either one sided originals or from one side of two sided originals.

FIG. 2 is a diagrammatic representation of apparatus by means of which two previously processed and prewet right reading lithographic masters bearing images of surfaces two sides of a two sided original may be attached to two plate supporting surfaces of an offset duplicator capable of printing two sides of a sheet simultaneously on sheets of ordinary copy paper with both sides of the sheet being printed on the offset lithographic duplicating process and with the ability to attach and run successive pairs of such offset masters without waiting to clean the residual image from the previous run from the offset blankets involved.

FIG. 3 is a diagrammatic plan view of the way in which a copier capable of producing right reading offset lithographic masters together with means for processing and pre-wetting such masters could be combined with the offset duplicator of FIGS. 1 or 2 to form an integrated copier-duplicator.

FIG. 4 is a diagrammatic showing of an alternative means by which the copy sheets of the apparatus illustrated in FIG. 2 and bearing images on both sides thereof could be stripped and delivered.

Referring now to FIG. 1, number 1 is a large cylinder on which are mounted a plate segment 2 having plate clamping means 3 by means of which an offset lithographic master 38 may be held in position on the surface of the segment and an impression segment 4 which carries lifter cams 8 to prevent the ink and dampening form rollers from contacting the surface of the impression segment. At the leading edge of the impression segment are grippers 5 which seize a sheet of copy paper and carry it through the bite between cylinder 1 and cylinder 9 to the point where stripper fingers 26 strip the sheet away from the impression segment as the grippers 5 release the sheet so that the leading edge of the sheet is presented to the delivery rollers 27 which in turn deliver it into the receiving hopper 28 where the printed copy sheets are accumulated at 39. Cylinder 9 is a blanket cylinder mounted to rotate about an eccentrically mounted shaft 11 for movement toward and away from the large cylinder 1. The effective printing diameter of blanket cylinder 9 together with the lithographic blanket 10 mounted on the surface thereof is equal to one-half the effective printing diameter of large cylinder 1. The detailed construction and arrangement of the parts may be substantially as illustrated and described in George U.S. Pat. No. 2,759,416. A lithographic master may be automatically attached to plate segment 2 in the manner illustrated and described in Rossetto U.S. Pat. No. 2,935,937, Fischetti U.S. Pat. No. 2,990,768 and Brunt U.S. Pat. No. 3,112,696 which describe and illustrate the manner in which such a lithograph master may be automatically attached to such a plate segment and then ejected therefrom at the end of the run. When the plates are ejected, they are stripped from the plate segment by strippers 29 and delivered by delivery rollers 30 into hopper 31 where the used plates are accumulated at 40.

After a lithographic master has been attached to the plate segment, it is dampened by dampening rolls 7 and inked by ink rollers 6 which in turn are lifted out of contact with the impression segment 4 by means of cams 8, all as illustrated and described in George U.S. Pat. No. 2,798,425.

Copy sheets 18 are fed from a stack constituting a supply of such sheets by means of a sucker foot 19 into pull out rollers 20 all as illustrated and described in Davidson U.S. Pat. No. 1,963,694. Double sheets are then ejected and deflected into a receiver for rejected sheets 22, all as illustrated and described in Davidson U.S. Pat. Re. No. 20,581.

The individual copy sheets are then conveyed by conveyor 23 which may be of the type shown in Davidson U.S. Pat. No. 2,083,296 or Trydal U.S. Pat. No. 2,294,504 to stop fingers 25 and feed roll mechanism 24 which may be of the type shown in Davidson U.S. Pat. No. 2,246,508 or Davidson U.S. Pat. No. 2,249,505 or preferably to paper feeding mechanism such as that shown in Fischetti U.S. Pat. No. 2,990,768 or Brunt U.S. Pat. No. 3,112,696.

There is an automatic blanket cleaner 15 which may be of the type shown in George U.S. Pat. No. 2,704,029 of the type shown in George U.S. Pat. No. 2,759,416 or of the type shown in Clausen U.S. Pat. No. 3,408,934. The means by which the automatic sequencing to be described herein may be accomplished, may follow the teachings of George U.S. Pat. No. 2,756,672, Tonkin U.S. Pat. Nos. 3,412,676 or 3,508,490 or 3,496,864, or Burger U.S. Pat. No. 3,457,857, or Mignone U.S. Pat. No. 3,451,336.

There is a second blanket cylinder 12 mounted in the position shown in FIG. 1 and also rotating about an eccentrically mounted shaft 14 in the manner described for blanket cylinder 9. Blanket cylinder 12 carries a lithographic offset blanket 13 on its surface. Blanket cleaner 15 has two blanket cleaning sponge like surfaces 16 and 17, both of which are supplied with blanket cleaning fluid from an external source through tube 42. Blanket cleaner 15 is mounted as shown in FIG. 1 so that it may pivot into contact with either blanket 10 on blanket cylinder 9 or into contact with blanket 13 on blanket cylinder 12. There is a tray 41 as seen in FIG. 1 mounted between blanket cylinder 9 and blanket cylinder 12 and above large cylinder 1 in a position to catch any drippings of blanket cleaning fluid that may drop from out of the blanket cleaner 15.

The operation of the device illustrated diagrammatically in FIG. 1 is as follows. The first of a series of right reading lithographic offset masters is presented in position on guide rails 32 and 33 after having been produced, processed and pre-wet.

Guide rails 32 and 33 then move into their dotted line positions as seen in FIG. 1 causing plate 34 to drop onto the moving tapes of conveyor 23 which convey

the lithographic plate or master to the stop fingers 25 and feed rolls 24. As the leading edge of the plate segment 2 passes the position of the stop fingers and feed rolls 25 and 24, the plate holding grippers 3 are open and the stop fingers and feed rolls work cooperatively with the plate holding grippers 3 at the leading edge of the plate segment to present the leading edge of the plate into the grippers 3 and seize and hold the plate in position on the surface of plate segment 2. The detail of this transfer may be as described and illustrated in Rossetto U.S. Pat. No. 2,935,397, Fischetti U.S. Pat. No. 2,990,768 and Brunt U.S. Pat. No. 3,112,696.

As large cylinder 1 continues to revolve in a counterclockwise direction as seen in FIG. 1, the lithographic offset master shown at 38 is carried by the damping rolls 7 and the inking rolls 6 on each revolution of large cylinder 1. Blanket cylinder 12 is held out of contact with large cylinder 1 whereas blanket cylinder 9 moves into and out of cntact with large cylinder 1 in response to the presence or absence of sheets of copy paper as illustrated and described in George U.S. Pat. No. 2,759,416. Copy sheets are then fed from the supply at 18 and the presence of copy sheets causes blanket cylinder 9 to be latched into contact with large cylinder 1 so that the right reading image on plate 38 on segment 2 is transferred onto the surface of blanket 10 mounted on blanket cylinder 9.

Copy sheets are fed to every other revolution of blanket cylinder 9, or in other words, to each revolution of large cylinder 1 timed to be fed by the stop finger and feed roll mechanism 25 and 24 into the grippers 5 at the leading edge of the impression segment, all as illustrated and described in Geroge U.S. Pat. No. 2,759,416. The grippers 5 hold the leading edge of the sheet of copy paper and carry it through the bite between large cylinder 1 and blanket cylinder 9 so that impression segment 4 presses the sheet against the surface of resilient blanket 10 causing the image that was transferred thereto from plate 38 to be in turn transferred or offset onto the face of the copy paper. As the grippers 5 approach the stripper fingers 26, the grippers open and the leading edge of the sheet is stripped from the impression segment 4 by the stripper fingers 26 and passes into the bite of the delivery rolls 27 which deliver the sheet into the hopper 28 where the copy sheets accumulate at 39. The stripping and delivery of the sheets is as described in Dell U.S. Pat. No. 2,647,462 or in George U.S. Pat. No. 2,759,416.

A preset number of copies are thus fed, printed and and delivered and while this process is taking place, a second right reading lithographic offset master or plate is delivered at position 34 on guide rails 32 and 33.

After the preset number of copies have been produced, the lithographic plate or master 38 is released by the grippers 3 as the leading edge of plate segment approaches stripper fingers 29 and the lithographic master is then delivered into delivery rollers 30 which in turn deliver it into hopper 31 where the used plates accumulate at 40.

The programming may be as shown and described in Mignone U.S. Pat. No. 3,451,336 and the release and delivery of the lithographic paper master may be accomplished in the manner illustrated and described in Rossetto U.S. Pat. No. 2,935,937 or Fischetti U.S. Pat. No. 2,990,768 or Brunt U.S. Pat. No. 3,112,696.

As the first lithographic master is ejected as described, blanket cylinder 9 moves out of contact with large cylinder 1 and the sponge surface 16 of blanket cleaner 15 pivots into contact with the blanket 10 carried by blanket cylinder 9. Blanket cylinder 12 carrying blanket 13 moves into the control of the presence or absence of copy sheets being fed from the supply at 18 and remains out of contact with large cylinder 1 when copy sheets are not being fed but moves into contact with large cylinder 1 when copy sheets are fed from the supply at 18.

Also, as the first plate is ejected into the hopper 31, the second plate at 34 is dropped onto conveyor 23 as previously described and is carried by conveyor 23 to the stops 25 and then automatically attached to the plate segment 2 through the co-operative action of the stop fingers 25, the feed rollers 24 and the plate holding grippers 3 as the grippers 3 next pass the position on the stop fingers 25, all as previously described. The second lithographic master is then dampened by the dampening rollers 7 and inked by the ink rollers 6 on each revolution of large cylinder 1 and as sheets are again fed from the supply at 18, blanket cylinder 12 latches into engagement with large cylinder 1 and the right reading image on the second plate now carried by plate segment 2 is offset onto the surface of blanket 13 so that copy sheets fed to grippers 5 at the leading edge of impression segment 4 are now not touched by blanket 10 on blanket cylinder 9 which is held out of engagement with large cylinder 1 but are printed by being pressed by impression segment 4 against the resilient surface of blanket 13 so that the inked image on blanket 13 is offset onto the top surface of the sheets and as previously described, these sheets are released by grippers 5, stripped by strippers 26 and delivered by delivery rollers 27 into hopper 28 onto the supply of copy sheets 39.

While the predetermined number of copies to be produced from this second plate are being thus fed, printed and delivered, a third right reading lithographic master having been produced, processed and pre-wet is presented at position 34 on guide rails 32 and 33 and blanket cleaner 15 cleans the residual image from the first plate from the surface of blanket 10 on blanket cylinder 9 and then moves into a neutral position between cylinders 9 and 12 and the blanket cleaning fluid on the surface of blanket 10 dries through evaporation.

Upon the completion of the printing and delivery of the preset number of copies to be produced from this second plate, the second plate is ejected and delivered into the hopper for used plates 31 and comes to rest at the position 40 and as this takes place, blanket cylinder 12 moves out of engagement with large cylinder 1 and the blanket cleaner 15 moves into position so that the cleaning sponge 17 contacts the surface of blanket 13 on blanket cylinder 12. At the same time, the third lithographic master at position 34 is dropped onto the conveyor 23 and the process is repeated with the image from the third plate being offset again onto blanket 10 on blanket cylinder 9 as copy sheets are fed from the supply at 18.

This process is repeated as this series of right reading lithographic masters is presented successively to the position 34 and then automatically attached to the plate segment 2 with the preset number of copies then being fed, printed and delivered, all as previously described but with each successive plate being printed from an alternate one of the two blankets 10 and 13 mounted on blanket cylinders 9 and 12 and with the

blanket cylinder which is not being used having the residual image from the previous plate cleaned from it during the run, during which time the next plate is produced, processed, pre-wet and presented at the position **34** ready for use as soon as the run in process has been completed.

FIG. **4** is a diagrammatic representation of the manner in which a copier plate maker **35**, a processor **36** and a pre-wetter **60** may be positioned to automatically produce, process and pre-wet a series of right reading lithographic masters into position **34** on guide rails **32** and **33** in rhythm with the operation of the duplicator as previously described.

All of this could be timed and controlled in the manner described in Mignone U.S. Pat. No. 3,451,336 with the exception that the copier plate maker would be of the type commonly used to make right reading lithographic masters instead of the mirror image lithographic masters as described in the Mignone patent.

FIG. **2** is a diagrammatic representation of apparatus by which the method of the invention may be employed to produce two sided copies on ordinary copy paper with the two sides of each sheet being printed simultaneously.

This apparatus may be used to produce exact copies of two sided originals or to produce two sided copies with the copy on one side being a reproduction on one original and the copy on the other side being a reproduction of another original. Also, this apparatus may be used to produce one sided copies.

As will be seen in FIG. **2**, the large cylinder in this case has an effective printing diameter three times the effective printing diameter of the smaller cylinders. Large cylinder **101** carries three segments of approximately equal circumferential length. Plate segment **102** carries a plate **138** on its surface held in position by plate holding grippers **103** at its leading edge. Blanket segment **104** carries a lithographic blanket **143** on its surface and copy sheet grippers **105** at its leading edge. At its sides it carries lifter cams **108** which act to lift the ink and damping form rolls out of contact with blanket surface **143.**

Blanket segment **144** carries a lithographic blanket **147** on its surface and has copy sheet grippers **145** at its leading edge and carries lifter cams **146** at either side to prevent the ink and dampening form rolls from contacting the surface of blanket **147.** There are two blanket drums **109** and **112** which are mounted to turn about eccentrically mounted shafts **111** and **114,** respectively, and which carry blankets **110** and **113** on their surfaces, all as previously described with respect to the similar blanket drums **9** and **12** of FIG. **1.**

Also, blanket cleaner **115** is mounted in a position which allows it to pivot so that either sponge surface **116** contacts blanket **110** on blanket cylinder **109** or sponge surface **117** contacts blanket **113** on blanket cylinder **112** or the blanket cleaner rests in a neutral position between the two blanket cylinders in which position neither blanket **110** nor **113** are contacted by the blanket cleaner sponges.

Blanket cleaning fluid is fed to the blanket cleaning sponges from an outside source through tube **142** and tray **141** catches any drippings from the blanket cleaner as described with respect to the FIG. **1** construction. The operation of the feeder which feeds sheets of copy paper from the supply at **118,** the separator **119,** the pull out rolls **120,** the double sheet eliminator **121** and the conveyor **123,** the feed rolls **124** and the stop fingers **125** all operate similarly to the equivalent parts previously described in the FIG. **1** construction.

Similarly, guide rails **132** and **133** hold a right reading processed and pre-wet lithographic master at position **134.**

The feeder acts to feed sheets to every third revolution of the blanket cylinders **109** and **112** or to each revolution of large cylinder **101.** Such sheets are fed either to the paper grippers **145** at the leading edge of blanket segment **144** or to the grippers **105** at the leading edge of blanket segment **104** as will hereinafter be described. Printed sheets are stripped by stripping fingers **126,** presented to delivery rollers **127** and delivered into the hopper **128** and accumulate at **139** in a manner similar to that described for the FIG. **1** construction.

Similarly, plates from position **134** are dropped onto conveyor **123** and attached to plate segment **102** by the cooperative action of stop fingers **125,** feed rolls **124** and plate grippers **103** all in the manner described for the FIG. **1** construction. Near the bottom of large cylinder **101** there is a plate cylinder **148** which has an effective printing diameter equal to the effective printing diameter of the two blanket cylinders **109** and **112** and also one-third the effective printing diameter of large cylinder **101.** Previously produced, processed and pre-wet plates are presented on guide rails **155** and **156** in position **163** and dropped onto conveyor **157** which conveys them to stop fingers **159.** There are plate holding grippers **151** at the leading edge of plate cylinder **148** and these plate holding grippers work in cooperation with stop fingers **159** and feed rolls **158** to automatically attach plates to plate cylinder **148** in a manner similar to that described for the automatic attachment of plates to segment **2** of FIG. **1** and to segment **102** of FIG. **3.**

Plate cylinder **148** is mounted to rotate about a shaft **150** which is eccentrically mounted in the manner previously described with respect to blanket cylinders **109** and **112.** Through this eccentric mounting plate cylinder **148** is caused to remain out of contact with plate segment **102** and to selectively roll in contact with either blanket **143** on segment **104** and not with blanket **147** on segment **144** or to roll in contact blanket **147** on segment **144** and not with blanket **143** on segment **104** as will be hereinafter described.

A plate on plate cylinder **148** is dampened by dampening rollers **154** and inked by ink rollers **106** on each revolution that it makes. Inking mechanism **106** delivers ink to the plate at **138** on plate segment **102** on large cylinder **101** through form rollers **161** and to plate **149** on plate cylinder **148** through form rollers **162** in the manner illustrated and described in Davidson Patent **2,911,107.**

Plates are ejected from plate cylinder **148** by being released by plate holding grippers **151** and stripped away by strippers **152** into delivery rollers **153** which deliver the plates onto a conveyor **164** which in turn carries them to another set of delivery rollers **165** which deposits them into hopper **190** where they accumulate at **166.**

A blanket cleaner **167** is arranged as shown in FIG. **3** in cooperation with large cylinder **101** and controlled so that its sponge like cleaning surface **168** may be caused to contact either blanket **143** on blanket seg-

ment 104 or blanket 147 on blanket segment 144 but only one or the other during any given run and never contacts the plate at 138 on plate segment 102. Blanket cleaning fluid is fed to the blanket cleaner from an external source through a tube 169 and a tray 170 is provided to catch any drippings that may fall from blanket cleaner 167. The detail of the operation of the various parts that are shown diagrammatically and the control of the sequence of events as hereinafter described follow the teachings of the patents previously referred to in describing similar apparatus and control functions with respect to the FIG. 1 apparatus.

The functioning of the FIG. 2 apparatus is as follows:

Separate right reading lithographic masters, one bearing the image from one side of a two sided original and the other bearing an image from the other side of the same two sided original (or bearing two different images from two different originals which it is desired to reproduce on opposite sides of the same copy sheets) are presented at positions 134 and 163 having been previously processed and pre-wet. Guide rails 132 and 133 move into their dotted line positions simultaneously with the moving of guide rails 155 and 156 into their dotted line positions so that the master at position 134 is dropped onto the conveyor 123 at the same time that the master at position 163 is dropped onto the conveyor 157. The two lithographic plates or masters are then conveyed to their respective stop fingers 125 and 159 and the plate from position 134 is automatically attached to plate segment 102 through the cooperation of stop fingers 125, feed rolls 124 and plate grippers 103 as previously described and the plate from position 163 is similarly automatically attached to plate cylinder 148 through the cooperative action of stop fingers 159, feed rolls 158 and plate grippers 151, all as previously described. The right reading lithographic master at position 134 is presented to that position with its image facing upwardly and the right reading lithographic master at position 163 is presented to that position with its image facing down.

The plate from position 134 is then held in position 138 on plate segment 102 and is dampened by dampening rollers 107 and inked by ink form rolls 161 on each revolution of large cylinder 101.

The plate from position 163 is then held in position 149 on plate cylinder 148 and is dampened by the dampening rollers 154 and inked by the ink form rollers 162 on each revolution of plate cylinder 148.

Blanket 113 on blanket cylinder 112 is held out of contact with large cylinder 101 and blanket cylinder 109 carrying blanket 110 is held out of contact with both blanket segment 104 and blanket segment 144 but contacts the plate at position 138 on plate segment 102 in response to the presence or absence of sheets being fed from the supply at 118.

The plate at position 149 on plate cylinder 148 is held out of contact with the plate on plate segment 102 and with the blanket 147 on blanket segment 144 but contacts blanket 143 on blanket segment 104 and rolls in contact therewith in response to the feeding of paper from the supply at 118 but remains out of contact with blanket 143 when no paper is being fed from the supply at 118.

As sheets are fed from the supply at 118, blanket 110 on blanket cylinder 109 rolls in contact with the plate at 138 on plate segment 102 and the plate at 149 on plate cylinder 148 rolls in contact with the blanket 143 on blanket segment 104. Copy sheets are fed one for each revolution of large cylinder 101 timed to be delivered by stop fingers 125 and feed rolls 124 into the paper grippers 105 at the leading edge of blanket segment 104. As each sheet passes between the bite of blanket cylinder 109 and large cylinder 101, the sheet is squeezed between blanket 110 on blanket cylinder 109 and blanket 143 on blanket segment 104 and has the image from blanket 110 printed on its top surface and the image from blanket 143 printed on its bottom surface simultaneously. As the paper grippers 105 approach the stripper fingers 126 they open to release the sheet and the sheet is stripped from blanket 143 by stripper fingers 126 delivered into delivery rollers 127, and in turn delivered into the hopper 128 where the copies accumulate at 139.

This process continues until the preset number of sheets have been thus printed at which point the feeding of the sheets stops.

While the sheets are being printed, a second pair of plates have been processed, pre-etched and presented to positions 134 and 163.

Upon the cessation of the feeding of sheets, blanket cylinder 109 moves out of contact with large cylinder 101 and plate cylinder 148 moves out of contact with large cylinder 101. The plate at 138 is released by the plate gripping fingers 103 as they approach the strippers 129, the plate is stripped by the strippers 129 and delivered by the delivery rollers 130 into the hopper 131 where the plates accumulate at 140. At the same time the plate at 149 is released by the plate holding grippers 151 as they approach the strippers 152 and the plate is thereby stripped by the strippers 152 presented to the delivery rollers 153 and out onto the conveyor 164 which in turn carries it to the second set of delivery rollers 165 which in turn deliver it into the hopper 190 where the plates accumulate at 166. At the same time, blanket cleaner 115 moves into position so that blanket cleaner sponge 116 contacts the surface of blanket 110 to clean the residual image from the surface thereof. At the same time, blanket cleaner 167 moves into position so that sponge 168 contacts the surface of blanket 143 carried on blanket segment 104 to remove the residual image therefrom.

At the same time, blanket cylinder 112 moves into the control of the sensing mechanism so that as sheets are fed from the supply 118 it will move into contact with the plate at 138 on plate segment 102. Similarly, cylinder 148 is latched out of contact with blanket 143 on blanket segment 104, but moves into the control of the sensing mechanism so that it will roll in contact with blanket 147 on blanket segment 144 in response to the feeding of sheets from the supply at 118.

The new plates at positions 134 and 163 are released and drop onto the conveyors 123 and 157 and move into contact with the stop fingers 125 and 159, respectively. They are then automatically attached to plate segment 102 and plate cylinder 148 as previously described. They are then each inked and dampened as previously described and sheets are once again fed from the supply at 118 with one sheet being fed to each revolution of the large cylinder 101 but now timed to be fed to the paper grippers 145 at the leading edge of blanket segment 144. Thus, on each revolution of large cylinder 101, the image on the plate at 138 is transferred to the blanket 113 on blanket cylinder 112 and the image on the plate at 149 on plate cylinder 148 is

transferred to the blanket **147** of blanket segment **144** and a sheet is fed to the grippers **145** at the leading edge of blanket segment **144** and is carried through the bite between large cylinder **101** and blanket cylinder **112** and as it passes through the bite it is squeezed between blanket **113** and blanket **147** thus having the image from the plate at **138** printed on its top surface and the image from the plate **149** printed on its bottom surface simultaneously. As the grippers **145** approach the stripper fingers **126** they open and release the sheet and the sheet is stripped by the stripper fingers **126,** delivered into the delivery rollers **127,** which in turn deliver it onto the supply at **139** in the hopper **128.**

While the preset number of sheets is thus being fed, the next pair of plates are being produced, processed and prewet and presented to positions **134** and **136** and blanket **110** on blanket cylinder **109** is being cleaned and then allowed to dry by evaporation and the blanket **143** on blanket segment **104** is being cleaned and then allowed to dry by evaporation.

When the preset number of copies have been fed from the supply at **118** and delivered into the hopper **128,** the feeder ceases to feed copy sheets, blanket cylinder **112** and plate cylinder **148** move out of contact with large cylinder **101** in response to the stoppage of feeding of sheets, the plate at **138** is released, stripped and delivered into the supply at **148** in hopper **131** and the plate at **149** is released and stripped and delivered into the supply at **166** in hopper **190.** Blanket cleaner **115** swings into position so that sponge surface **117** contacts blanket **113** on blanket cylinder **112** and blanket cleaner **167** moves into position so that sponge surface **168** contacts blanket **147** on blanket segment **144.**

Blanket cylinder **109** moves back into the control of the sensing mechanism so that when sheets are again fed from the supply at **118** it will move into contact with the plate at **138** on plate segment **102** and plate cylinder **148** is latched out of contact with blanket segment **144** but moves back into control of the sensing mechanism so that it will roll in contact with the blanket **143** on blanket segment **104** when sheets are again fed from the supply at **118.** The plates in positions **134** and **163** are released and automatically attached to plate segment **102** and plate cylinder **148** respectively as previously described. Each of these plates is dampened and inked on each revolution of large cylinder **101** and plate cylinder **148,** respectively, and the feeder again begins feeding the next preset number of sheets, this time feeding one sheet to each revolution of the large cylinder **101** but timed to be fed to the paper grippers **105** at the leading edge of blanket segment **104** and once again as the sheets pass between the bite of blanket segment **109** and large cylinder **101,** they are printed with the image from blanket **110** being printed on their top surface and the image from blanket **143** being printed on their bottom surface.

This process is repeated as the series of pairs of plates from different two sided originals are produced, processed, pre-wet and presented successively to positions **134** and **163.**

In FIG. **3,** the copier **35** that produces the right reading lithographic masters and passes them through the processor **36** and the pre-wetter **60,** may be either of the type that delivers individual plates or may be of the type that produces such plates from a roll of material in which case a guilotine cutter represented by **37** in FIG. **3** cuts each individual plate from the roll as it is presented onto the guides **32** and **33** where it assumes position **34** and proceeds as previously described.

FIG. **4** illustrates an alternative method of stripping and delivering the copy sheets which may be particularly useful in the FIG. **2** configuration in which the copy sheets are printed simultaneously on both sides and may in some instances present stripping and delivery problems if the strippers and delivery rollers of the type illustrated at **126** and **127** are employed.

The alternative construction illustrated in FIG. **4** consists of a chain delivery mechanism which may be of the type illustrated and described in detail in Thomsen U.S. Pat. No. 2,730,364 in which two pairs of sprockets **173** and **174** carry parallel spaced chains **175** which in turn carry between them gripper bars **176** and **177.**

The length of the chains **175** is equal to the circumference of large cylinder **101** and gripper bar **176** is placed so that it will always come into coincidence with gripper **145** on blanket segment **144** and gripper bar **177** is so placed that it will always come into coincidence with paper gripper **105** at the leading edge of blanket segment **104.**

Thus, if sheets are being fed to gripper **145** at the leading edge of blanket segment **144,** the sheet will be transferred from the gripper **145** to the gripper **176** and carried out against the stop **179** at which point the gripper will release it and the sheet will fall onto the stack of sheets at **139** which is carried by receding support member **180.**

Similarly, if sheets are being fed to gripper **105** at the leading edge of blanket segment **104,** then the sheets will be transferred from gripper **105** to gripper **177** and similarly carried out against stop **179** at which point they will be released by gripper **177** and dropped upon the stack of sheets at **139** carried by the receding support member **180** which is mounted and controlled in the manner well known in the art.

When the chain delivery stripping mechanism **172** as illustrated in FIG. **4** is used, the hopper **131** for receiving plates ejected from position **138** on plate segment **102** is dropped down to the position shown in FIG. **4** and a deflector member **171** is added to guide the plates as they are ejected onto the stack of previously ejected plates at **140.**

It will thus be seen that a method and apparatus have been disclosed by means of which high quality copies may be produced on ordinary copy paper with the copy sheets being fed, printed and delivered at a relatively high number of sheets per hour, and by means of which the time between the production of the last copy from one master or pair of masters and the production of the first copy from the next master or pair of masters is reduced to a minimum thereby making it possible to produce copies from a relatively large number of masters in any given period of time.

In addition, a method and apparatus have been disclosed whereby high quality two sided copies of two sided originals may be produced on ordinary copy paper while still retaining the advantages of producing a relatively high number of copies per hour and producing copies of a relatively large number of originals within a given period of time.

Under most operating conditions for which this type of equipment will be used, the number of copies to be produced from each original will be sufficient that the time required to produce these copies will provide

ample time for the completion of the cleaning of the blanket or pair of blankets used to produce the copies from the proceeding master or masters and to allow the cleaning solution to dry by evaporation. However, it is intended that the sequence of events whether controlled manually or programmed will be such that if the blanket cleaning and evaporation of the cleaning fluid are completed before the desired number of copies are run, then the completion of the desired number of copies will trigger the removal of the master or masters and the starting of the next cycle whereas if the desired number of copies are completed before the blanket or blankets have been cleaned and the cleaning fluid has evaporated (which two events together constitute the complete blanket cleaning procedure), then the completion of the blanket cleaning procedure will trigger the ejection of the master or masters and the start of the next cycle.

It is also contemplated that there could be some overlap between the two cycles in circumstances where it is found that the number of revolutions of the cylinders required for the evaporation of the cleaning fluid equals the number of revolutions required for the attaching of the next master or masters and of preparation to transfer an inked image to the blanket surface in which case the next cycle could start before the cleaning fluid had completely evaporated since its evaporation would be complete by the time the feeding of sheets began and the blanket cylinder was latched into contact with the master surface.

It will be clear to one skilled in the art that the offset lithographic masters could either be produced, processed and pre-wet as has been described herein by means of a copier assembled and synchronized with the duplicator as illustrated in FIG. 3 and programmed to produce, process and pre-wet masters in synchronization with the duplicator as has been described or alternatively, in the FIG. 1 construction a series of lithographic masters could be prepared separate and apart from the duplicator by any of the many known methods and loaded in sequence into a master feeder which would take the place of the master introducing guide rails 32 and 33 of FIG. 1. The feeding, pre-wetting, attaching, dampening, inking, blanket cleaning and ejection of masters could then be accomplished and programmed in the manner set forth in the Tonkin U.S. Pat. No. 3,412,676, the Tonkin U.S. Pat. No. 3,508,490, the Tonkin U.S. Pat. No. 3,496,864, or the Berger U.S. Pat. No. 3,457,857.

Similarly, the feeding, attaching and ejecting of masters could be accomplished in the manner taught by the Gamiter U.S. Pat. No. 3,420,169, the Rossetto U.S. Pat. No. 2,935,937, the Fischetti U.S. Pat. No. 2,990,768 or the Brunt U.S. Pat. No. 3,112,696 with the pre-wetting being performed in the manner disclosed in the Hilpman U.S. Pat. No. 3,144,823 and the blanket cleaning in the manner disclosed in the George U.S. Pat. No. 2,759,416.

Similarly, in the FIG. 2 configuration previously prepared lithographic masters could be introduced as just described in place of both the master supporting guides 132 and 133 and 155 and 156.

Any of these approaches could be combined with the new and novel method and apparatus disclosed herein.

FIG. 1 shows a single blanket cleaner 15 which can be used to clean either of the two blankets 10 or 13, but it is, of course, not necessary to the invention that only one blanket cleaner be used, and the same purpose could be accomplished by having two blanket cleaners, one to clean blanket 10 on blanket cylinder 9 and the other to clean blanket 13 on blanket cylinder 12, and these could be used alternately in accordance with the disclosure hereinbefore described in the specification.

While the specific embodiment of the invention illustrated and heretofore described relates the method of the invention to its use in connection with an offset duplicator as the means for producing multiple copies, it should be noted that the method disclosed may also be applied to any copying device in which the copies are produced by means which involves an intermediate, or offset, transfer between a master or an original and the copies produced.

In all such cases there is an intermediate (or offset) member onto which a mirror image (or latent mirror image) is first transferred from the master or the original, and from which the image is then transferred (or offset) onto the copies.

Such an offset or intermediate member may take a number of different forms including but not limited to cylinders, drums, belts, planar surfaces etc., any of which may be used as a "transfer surface" within the scope of the method of the invention disclosed.

A "plurality" of transfer surfaces may consist of a multiple of such members, or of a single such member together with provisions for using different portions of such member alternately, in the manner disclosed in describing the method of the invention.

All such copying means, which employ an offset step and a transfer surface, face the same need to clean or to remove the image (or latent image) from the transfer surface when the running of copies from one master or original has been completed and before copies from another master or original may be produced.

The method of this invention, which involves the provision of a plurality of such transfer surfaces and the alternate use thereof, so that the cleaning of one such transfer surface may take place while copies are being run from another, is thus applicable to any copying method or device in which an image (or latent image) is offset from a master or an original onto a transfer surface, and from there onto the copies produced.

While the specific embodiment of the invention shown and described relates the method of the invention to its use in connection with an offset duplicator as the means producing multiple copies, the method may also be applied to any copying device in which the copies are produced by means which involves an intermediate, or offset, transfer between a master or an original and the copies produced.

The embodiments of this invention in which an exclusive property or privilege is claimed are defined as follows:

1. The method of producing multiple copies from each of a series of offset lithographic masters carrying right reading images thereon which includes providing:
   a. a master supporting surface and means for attaching and removing a master on said surface,
   b. a first offset blanket supporting surface carrying a first offset blanket thereon,
   c. a second offset blanket supporting surface carrying a second offset blanket thereon, and
   d. an impression surface, and which includes the steps of:

1. attaching the first master in the series to the master supporting surface,
2. inking the image thereon and causing the inked surface of the master to roll in contact with the surface of the first blanket while holding the surface of the second blanket out of contact with the master supporting surface, whereby the inked image is offset onto the surface of the first blanket,
3. causing the image bearing surface of the first blanket to roll against the impression surface while a sheet of copy paper is passed therebetween, whereby the inked image from the first master is offset onto the copy paper,
4. repeating this procedure until the desired number of copies from the first master have been produced,
5. removing the first master from the master supporting surface and attaching the second master thereto,
6. inking the image thereon and causing the inked surface of the second master to roll in contact with the surface of the second blanket, whereby the inked image is offset onto the surface of the second blanket,
7. causing the image bearing surface of the second blanket to roll against the impression surface while a sheet of copy paper is passed therebetween, whereby the inked image from the second master is offset onto the copy paper,
8. repeating this procedure until the desired number of copies from the second master have been produced, and
9. while these copies are being produced from the second master, holding the surface of the first blanket out of contact with the master supporting surface and the impression surface and cleaning the residual ink image from the first master off the surface of the first blanket,
10. removing the second master from the master supporting surface upon the completion of the desired number of copies therefrom and attaching the third master thereto,
11. repeating the above procedure but with the image from the third master being offset from the master to the first blanket and from there to the copy paper and with the second blanket being held out of contact with the master supporting surface and the impression surface and the residual ink image from the second master being cleaned therefrom during the running of copies from the third master.

2. The method of producing multiple copies from each of a series of offset lithographic masters carrying right reading images thereon which includes providing:

a. a master supporting surface and means for attaching and removing a master on said surface,
b. a plurality of offset blanket supporting surfaces each carrying an offset blanket thereon, and
c. an impression surface, and which includes the steps of:
1. attaching the first master in the series to the master supporting surface,
2. inking the image thereon and causing the inked surface of the master to roll in contact with the surface of a first blanket while holding the surface of the other blanket or blankets out of contact with the master supporting surface, whereby the inked image is offset onto the surface of the said first blanket,
3. causing the image bearing surface of the first blanket to roll against the impression surface while a sheet of copy paper is passed therebetween, whereby the inked image from the first master is offset onto the copy paper,
4. repeating this procedure until the desired number of copies from the frist master have been produced,
5. removing the first master from the master supporting surface and attaching the second master thereto,
6. inking the image thereon and causing the inked surface of the second master to roll in contact with the surface of a second blanket whereby the inked image is offset onto the surface of the said second blanket,
7. causing the image bearing surface of the second blanket to roll against the impression surface while a sheet of copy paper is passed therebetween, whereby the inked image from the second master is offset onto the copy paper,
8. repeating this procedure until the desired number of copies from the second master have been produced, and
9. while these copies are being produced from the second master, holding the surface of the first blanket out of contact with the master supporting surface and the impression surface and cleaning the residual ink image from the first master off the surface of the first blanket,
10. removing the second master from the master supporting surface upon the completion of the desired number of copies therefrom and attaching the third master thereto,
11. repeating the above procedure but with the image from the third master being offset from the master to a blanket other than the second blanket and from there to the copy paper and with the second blanket being held out of contact with the master supporting surface and the impression surface, and the residual image from the second master being cleaned therfrom during the running of copies from the third master.

3. The method of producing multiple two sided copies from each of a series of pairs of offset lithographic masters carrying right reading images thereon, which includes providing:

a. a first master supporting surface and means for attaching and removing a master on said surface,
b. a second master supporting surface and means for attaching and removing a master on said surface,
c. a plurality of pairs of offset blanket supporting surfaces with each surface of each pair carrying an offset blanket thereon, and which includes the steps of:
1. attaching the two masters of the first pair of the series to the first and second master supporting surfaces respectively,
2. inking the image on each master of the pair and causing the inked surfaces of the two masters to roll in contact with the two surfaces respectively of the first pair of blankets on the first pair of blanket supporting surfaces while holding the surfaces of the other pair or pairs of blankets out

of contact with the master supporting surfaces, whereby the said inked images are offset onto the surfaces of the first pair of said blankets respectively,

3. causing the two image bearing surfaces of the two blankets of the first pair to roll against each other while a sheet of copy paper is passed therebetween, whereby the inked images from the two masters of the first pair of the series are offset onto the two sides of the sheet of copy paper,
4. repeating this procedure until the desired number of copies from the first pair of masters in the series have been produced,
5. removing the two masters of the first pair from the first and second master supporting surfaces respectively and attaching the two masters of the second pair of the series thereto,
6. inking the image on each master of the second pair and causing the inked surfaces of the two masters of the second pair to roll in contact with the two surfaces respectively of a second pair of blankets on a second pair of blanket supporting surfaces whereby the said inked images are offset onto the surfaces of the second pair of said blankets respectively,
7. causing the image bearing surfaces of the two blankets of the second pair to roll against each other while a sheet of copy paper is passed therebetween, whereby the inked images from the two masters of the second pair of the series are offset onto the two sides of the sheet of copy paper,
8. repeating this procedure until the desired number of copies from the second pair of masters in the series have been produced, and
9. while these copies are being produced from the second pair of masters in the series, holding the suraces of the two blankets of the first pair of blankets out of contact with the master supporting and other blanket supporting surfaces and cleaning the residual ink images from the first pair of masters off their surfaces,
10. removing the two masters of the second pair of masters from the first and second master supporting surfaces respectively upon the completion of the desired number of copies therefrom and attaching the two masters of the third pair of the series thereto,
11. repeating the above procedure but with the images from the two masters of the third pair of the series being offset from the two masters to the two blankets respectively of a pair of blankets other than the second pair, and from there to the two sides of the copy paper, and with the surfaces of the two blankets of the second pair of blankets being held out of contact with the master supporting and other blanket supporting surfaces and the residual ink images from the second pair of masters in the series being cleaned therefrom during the running of copies from the third pair of masters in the series.

4. The method of producing multiple copies from each of a series of originals having the right reading images thereon which includes providing:

a. a supporting surface for originals and means for applying and removing an original on said surface,
b. a first transfer surface,
c. a second transfer surface,
d. means to bring a selected one of the transfer surfaces into contact with successive sheets of copy paper, and which includes the steps of:
1. applying the first original in the series to the supporting surface for originals,
2. causing a mirror image of the image on the first original to be transferred onto the first transfer surface, but not onto the second transfer surface,
3. causing the said mirror image bearing first transfer surface to contact a sheet of copy paper whereby the right reading image from the first original is offset onto the copy paper,
4. repeating this procedure until the desired number of copies from the first original have been produced,
5. removing the first original from the supporting surface for originals and applying the second original thereto,
6. causing a mirror image of the image on the second original to be transferred onto the second transfer surface,
7. causing the said mirror image bearing second transfer surface to contact a sheet of copy paper, whereby the right reading image from the second original is offset onto the copy paper,
8. repeating this procedure until the desired number of copies from the second original have been produced, and
9. while these copies are being produced from the second original, keeping the first transfer surface out of contact with the supporting surface for originals and with the copy paper, and cleaning the residual image from the first original off the first transfer surface,
10. removing the second original from the supporting surface for originals and applying the third original thereto,
11. repeating the above procedure but with the image from the third original being transferred from there third original to the first transfer surface and from tere to the copy paper and with the second transfer surface being kept out of contact with the supporting surface for originals and with the copy paper, and the residual image from the second original being cleaned therefrom during the running of copies from the third original.

5. The method of producing multiple copies from each of a series of originals having right reading images thereon which includes providing:

a. a supporting surface for originals and means for applying and removing an original on said surface,
b. a plurality of transver surfaces, and
c. means for bringing a selected one of said transfer surfaces into contact with successive sheets of copy paper, and which includes the steps of:
1. applying the first original in the series to the supporting surface for originals,
2. causing a mirror image of the image on the first original to be transferred onto a first transfer surface, but not onto other transfer surfaces,
3. causing the said mirror image bearing first transfer surface to contact a sheet of copy paper whereby the right reading image from the first original is offset onto the copy paper,
4, repeating this procedure until the desired number of copies from the first original have been produced,

5. removing the first original from the supporting surface for originals and applying the second original thereto,
6. causing a mirror image of the image on the second original to be transferred onto a second transfer surface,
7. causing the said mirror image bearing second transfer surface to contact a sheet of copy paper whereby the right reading image from the second original is offset onto the copy paper,
8. repeating this procedure until the desired number of copies from the second original have been produced, and 9. while these copies are being produced from the second original, keeping the first transfer surface out of contact with the supporting surface for originals and with the copy paper, and cleaning the residual image from the first original off the first transfer surface, 10. removing the second original from the supporting surface for originals and applying the third original thereto, 11. repeating the above procedure but with the image from the third original being transferred from the original to a transfer surface other than the second transfer surface and from there to the copy paper; and with the second transfer surface being kept out of contact with the supporting surface for originals and with the copy paper, and the residual image from the second original being cleaned therefrom during the running of copies from the third original.

6. The method of producing multiple two sided copies from each of a series of pairs of originals having right reading images thereon, which includes providing:

a. a first supporting surface for originals and means for applying and removing an original on said surface,
b. a second supporting surface for originals and means for applying and removing an original on said surface,
c. a plurality of pairs of transfer surfaces, and which includes the steps of;
1. applying the two originals of the first pair of the series to the first and second supporting surfaces for originals, respectively,
2. causing a mirror image of each of the two images on the two originals of the first pair of the series to be transferred onto the two transfer surfaces respectively of the first pair of transfer surfaces, but not onto other pairs of transfer surfaces,
3. causing the two said mirror image bearing transfer surfaces of the first pair thereof to contact the two opposite sides of a sheet of copy paper, whereby the right reading images from the two originals on the first pair of the series are offset onto the two sides of the sheet of copy paper,
4. repeating this procedure until the desired number of two sided copies from the first pair of originals in the series have been produced,
5. removing the two originals of the first pair from the first and second supporting surfaces for originals respectively and applying the two originals of the second pair of the series thereto,
6. causing a mirror image of each of the two images on the two originals of the second pair of the series to be transferred onto the two transfer surfaces respectively of a second pair of transfer surfaces,
7. causing the said mirror image bearing transfer surfaces of the second pair thereof to contact the opposite sides of a sheet of copy paper, whereby the right reading images from the two originals of the second pair of the series are offset onto the two sides of the sheet of copy paper,
8. repeating this procedure until the desired number of two sided copies from the second pair of originals in the series have been produced, and
9. while these copies are being thus produced from the second pair of originals in the series, keeping the two transfer sirfaces of the first pair of transfer surfaces out of contact with supporting surfaces for originals, with other transfer surfaces and with the surface of the copy paper, and cleaning the residual images from the first pair of originals off their surfaces,
10. removing the two originals of the second pair of originals from the first and second supporting surfaces for originals respectively and applying the two originals of the third pair of the series thereto,
11. repeating the above procedure but with the images from the two originals of the third pair of the series being transferred from the said two originals to the two transfer surfaces respectively of a pair of transfer surfaces other than the second pair, and from there to the two sides of the copy paper; and with the two transfer surfaces of the second pair of transfer surfaces being kept out of contact with supporting surfaces for originals, with other transfer surfaces and with the surface of the copy paper, and the residual images from the second pair of originals in the series being cleaned therefrom during the running of two sided copies from the third pair of originals in the series.

7. The method of producing multiple two sided copies from each of a sequential series of pairs of originals having right reading images thereon, which includes providing:

a. at least one supporting surface for originals and means for applying and removing an original on said surface,
b. a plurality of pairs of transfer surfaces, and which includes the steps of:
1. applying the two originals of the first pair of the said sequential series of pairs to a supporting surface for originals,
2. causing a mirrow image of each of the two images on the two originals of the first pair of the series to be transferred onto the two transfer surfaces respectively of the first pair of transfer surfaces, but not onto other pairs of transfer surfaces,
3. causing the two said mirror image bearing transfer surfaces of the first pair thereof to contact the two opposite sides of a sheet of copy paper, whereby the right reading images from the two originals of the first pair of the series are offset onto the two sides of the sheet of copy paper,
4. repeating this procedure until the desired number of two sided copies from the first pair of originals in the series have been produced,
5. removing the two originals of the first pair from the supporting surface for originals and applying

the two originals of the second pair of the series thereto,

6. causing a mirror image of each of the two images on the two originals of the second pair of the series to be transferred onto the two transfer surfaces respectively of a second pair of transfer surfaces,

7. causing the said mirror image bearing transfer surfaces of the second pair thereof to contact the opposite sides of a sheet of copy paper, whereby the right reading images from the two originals of the second pair of the series are offset onto the two sides of the sheet of copy paper,

8. repeating this procedure until the desired number of two sided copies from the second pair of oroginals in the series have been produced, and

9. while these copies are being thus produced from the second pair of originals in the series, keeping the two transfer surfaces of the first pair of transfer surfaces out of contact with supporting surfaces for originals, with other transfer surfaces and with the surface of the copy paper, and cleaning the residual images from the first pair of originals off their surfaces,

10. removing the two originals of the second pair of originals from the supporting surfaces for originals and applying the two originals of the third pair of the series thereto,

11. repeating the above procedure but with the images from the two originals of the third pair of the series being transferred from the said two originals to the two transfer surfaces respectively of a pair of transfer surfaces other than the second pair, and from there to the two sides of the copy paper; and with the two transfer surfaces of the second pair of transfer surfaces being kept out of contact with supporting surfaces for originals, with other transfer surfaces and with the surface of the copy paper, and the residual images from the second pair of originals in the series being cleaned therefrom during the running of two sided copies from the third pair of originals in the series.

8. The method of producing multiple two sided copies from each of a series of two sided originals having right reading images thereon, which includes providing:

a. a supporting surface for originals so constructed that one side of an original supported thereon is visible and means for applying and removing an original on said surface,

b. a supporting surface for originals so constructed that the other side of an original supported thereon is visible and means for applying and removing an original on said surface,

c. a plurality of pairs of transfer surfaces, and which includes the steps of:

1. applying the first original of the series to the supporting surfaces for originals, in such a manner that both sides thereof become exposed.

2. causing a mirror image of each of the two images on the two sides of the first original of the series to be transferred onto the two transfer surfaces respectively of the first pair of transfer surfaces, but not onto other pairs of transfer surfaces,

3. causing the two said mirror image bearing transfer surfaces of the first pair thereof to contact the two opposite sides of a sheet of copy paper, whereby the right reading images from the two sides of the first original of the series are offset onto the two sides of the sheet of copy paper,

4. repeating this procedure until the desired number of two sided copies from the first two sided original in the series have been produced,

5. removing the first original from the supporting surface for originals and applying the second original of the series thereto in a manner similar to that in which the first original was applied,

6. causing a mirror image of each of the two images on the two sides of the second original of the series to be transferred onto the two transfer surfaces respectively of a second pair of transfer surfaces,

7. causing the said mirror image bearing transfer surfaces of the second pair thereof to contact the opposite sides of a sheet of copy paper, whereby the right reading images from the two sides of the second original of the series are offset onto the two sides of the sheet of copy paper,

8. repeating this procedure until the desired number of two sided copies from the second two sided original in the series have been produced, and

9. while these copies are being thus produced from the second original in the series, keeping the two transfer surfaces of the first pair of transfer surfaces out of contact with supporting surfaces for originals, with other transfer surfaces and with the surface of the copy paper, and cleaning the residual images from the first original off their surfaces,

10. removing the second original from the supporting surface for originals and applying the third original of the series thereto, in a manner similar to that in which the first and second originals were so applied,

11. repeating the above procedure but with the images from the two sides of the third original of the series being transferred from the said two sides of the third original to the two transfer surfaces respectively of a pair of transfer surfaces other than the second pair, and from there to the two sides of the copy paper; and with the two transfer surfaces of the second pair of transfer surfaces being kept out of contact with supporting surfaces for originals, with other transfer surfaces and with the surface of the copy paper, and the residual images from the second original in the series being cleaned therefrom during the running of two sided copies from the third two sided original in the series.

9. while these copies are being thus produced from the second original in the series, keeping the two transfer surfaces of the first pair of transfer surfaces out of contact with supporting surfaces for originals, with other transfer surfaces and with the surface of the copy paper, and cleaning the residual images from the first original off their surfaces,

10. removing the second original from the supporting surface for originals and applying the third original of the series thereto, in a manner similar to that in which the first and second originals were so applied,

11. repeating the above procedure but with the images from te two sides of the third original of the series being transferred from the said two sides of the third original to the two transfer surfaces respectively of a pair of transfer surfaces other than the second pair, and from there to the two sides of the copy paper; and with the two transfer surfaces of the second pair of transfer surfaces being kept out of contact with supporting surfaces for originals, with other transfer surfaces and with the surface of the copy paper, and the residual images from the second original in the series being cleaned therefrom during the running of two sided copies from the third two sided original in the series.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,785,289 Dated January 15, 1974

Inventor(s) William Ward Davidson, Jr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 16, line 10, "frist" should be --first--;
Column 16, line 45, "therfrom" should be --therefrom--;
Column 17, line 37, "suraces" should be --surfaces--;
Column 18, line 40, "there" should be --the--;
Column 18, line 41, "tere" should be --there--;
Column 18, line 53, "transver" should be --transfer--;
Column 19, in Claim 5 starting with line 13 Nos. 9, 10 and 11 should be new paragraphs;
Column 20, line 12, "sirfaces" should be --surfaces--;
Column 22, line 55 thru line 68 - duplicated;
Columns 23 and 24 also duplicated.

Signed and sealed this 25th day of June 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents