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Eichorn

[11] **3,793,016**

[45] **Feb. 19, 1974**

[54] **ELECTROPHOTOGRAPHIC SHEET BINDING PROCESS**

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[21] Appl. No.: **298,980**

[52] **U.S. Cl.** .... **96/1 R,** 96/15 D, 117/17.5, 118/637, 156/151, 156/291, 161/147, 281/21 R, 355/3

[51] **Int. Cl.** **G03g 13/00,** G03g 13/08

[58] **Field of Search** .... 96/1 R, 15 D; 117/17.5; 118/637; 161/147; 281/21 R; 156/291, 151

[56] **References Cited**

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3,692,606	9/1972	Miller et al.	156/151
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Primary Examiner—J. Travis Brown
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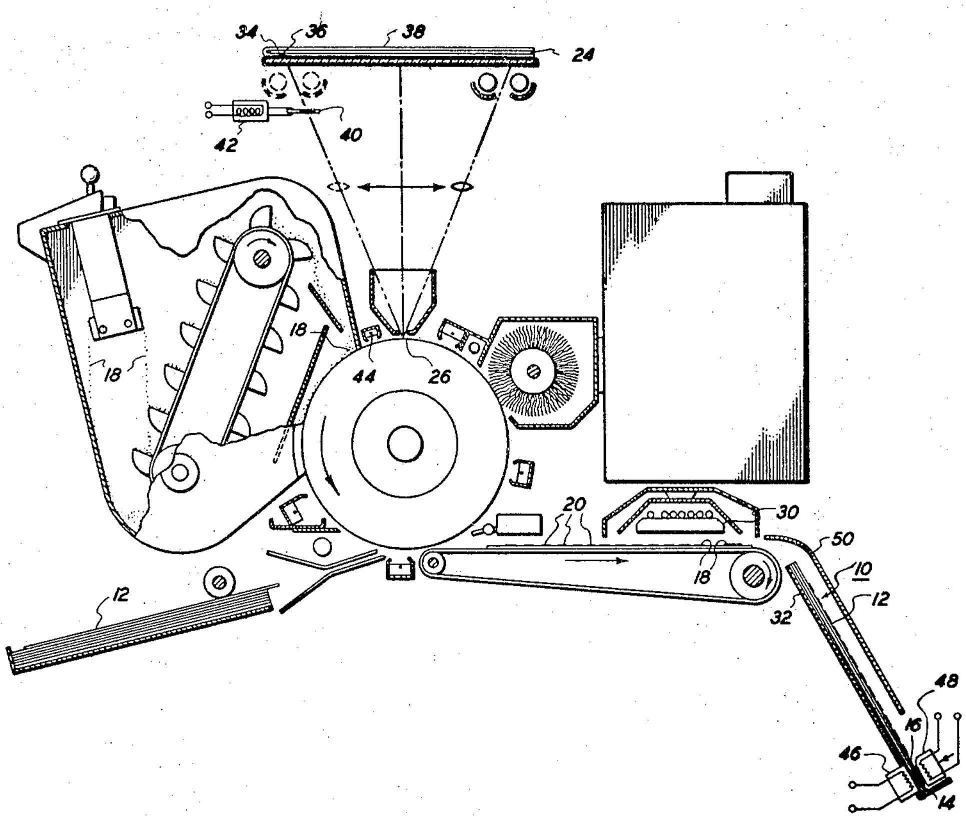
[57] **ABSTRACT**

Sheet binding where the printing medium itself is the sheet binder. In a xerographic process, high density areas of xerographic toner are provided at desired binding areas. Sufficiently high density toner areas are provided by inserting a finely apertured optical mask adapted to provide edge development effects to maximize overall toner density over the selected binding area, yet which is compatible with solid area coverage machines. These toner binding areas may then be subsequently re-fused between adjacent overlaying sheets to provide bound stacks, without requiring any additional binding material.

7 Claims, 7 Drawing Figures



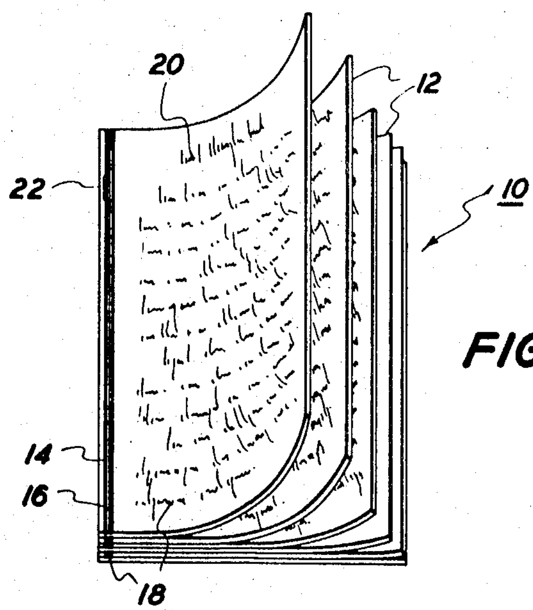


FIG. 1

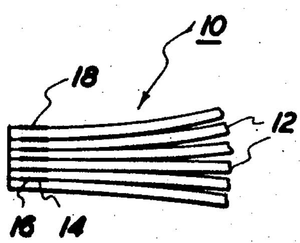
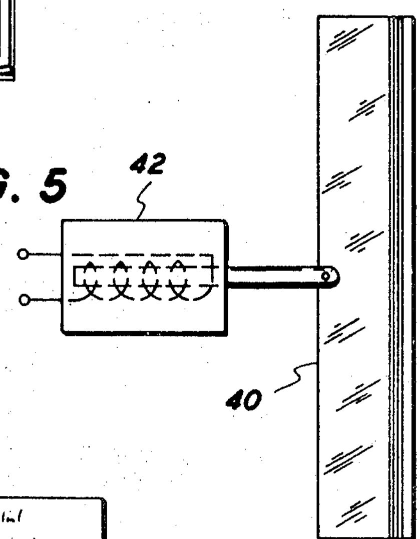


FIG. 2

FIG. 5



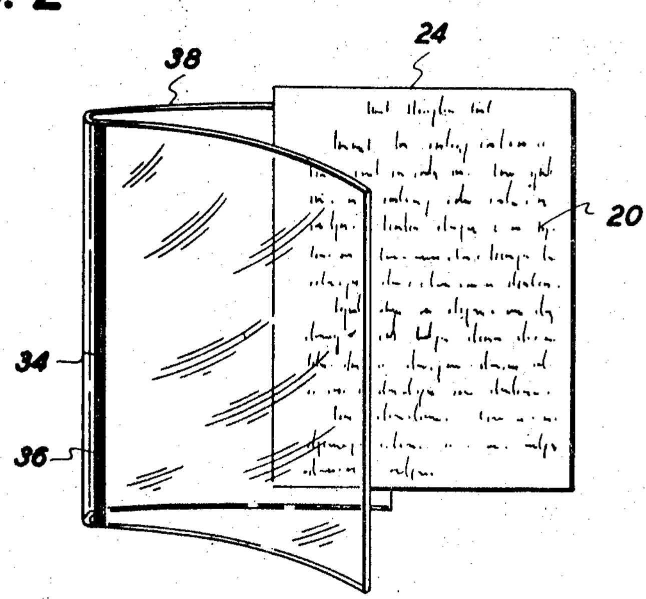


FIG. 3

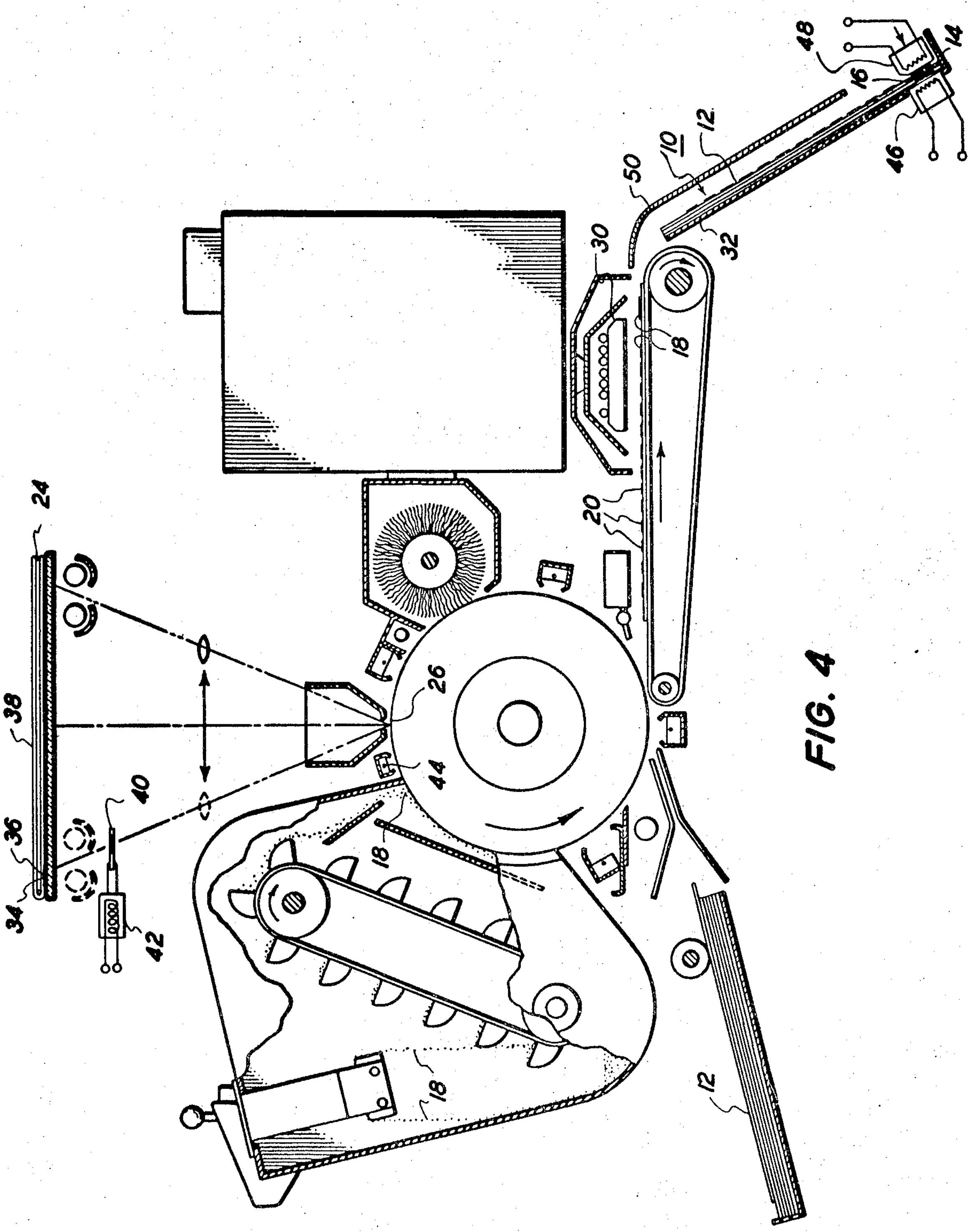


FIG. 4

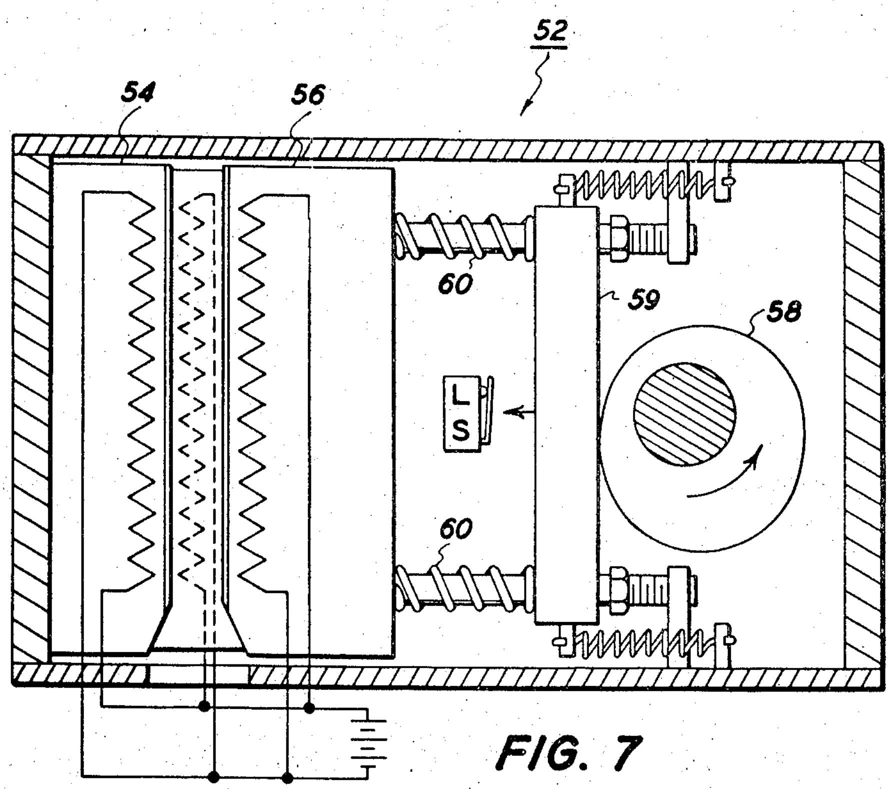


FIG. 7

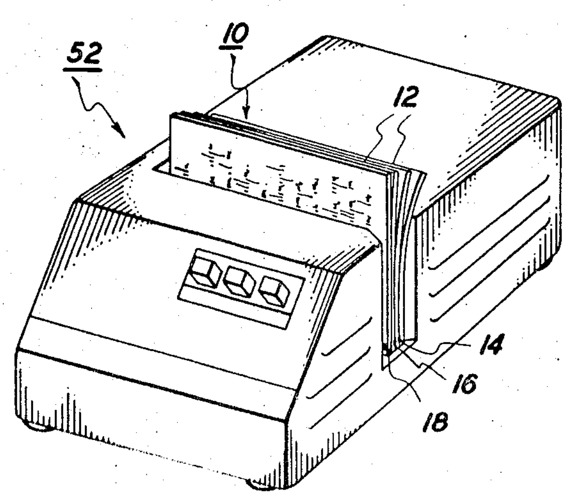


FIG. 6

ELECTROPHOTOGRAPHIC SHEET BINDING PROCESS

The present invention relates to a very simple and economical method of binding two or more indicia bearing sheets together by providing on the sheets additional minor high density areas of the same indicia imparting material in areas of desired binding, where the sheets are subsequently stacked and the additional indicia imparting material commonly fused between adjacent sheets at the binding areas to fasten the sheets together.

Sheet binding is one of the oldest known arts, and numerous methods and apparatus are known in the art for permanently or temporarily securing sheets together. Many of these, of course, are only economically suited for high priced or high volume commercial printing operations. There is a long standing need for improved sheet fastening means for localized, simple, and inexpensive binding of, for example, stacks of 2 to 50 pages.

This need has been greatly increased by the widespread use of xerographic equipment, where large numbers of printed sheets are produced by relatively unskilled personnel in non-commercial printing operations. The demand for simplicity and economy in these applications has continued to retain conventional metal staples as the primary fastening means. This is in spite of the fact that stapling, riveting or other sheet binding means requiring penetration of the sheet creates stress points in the sheets which encourage sheet tearing and inadvertent sheet removal. So does any sharp edges on the staples or rivets. Further, the pull-off strength of the top and bottom sheets in any stack fastened in this conventional manner is liminted by the strength of the sheet over only the small areas directly underlying the heads of the staple or rivet.

Thus, it is clear that a sheet binding method which provides inter-sheet adhension over a much larger binding area than staples or rivets, and which does not require any sheet penetration or sharp edges, is greatly preferable. Various adhesive bonding methods have been developed which have suitable binding strengths but they have not achieved widespread utilization in many low volume binding applications, apparently because they are not sufficiently simple and economical in comparison to metal staples or rivets. They require the supplying, handling and containment of separate adhensive materials, and require separate adhesive application steps in addition to the normal indicia printing steps. Examples from the adhesive binding are shown in U.S. Pat. Nos. 2,579,488; 2,831,706; 2,898,973; 3,026,228 and 3,502,532. Some of these utilize chemicals similar to those found in xerographic toners, but they are not toners or inks. Other examples of adhesive sheet welding with heat and/or pressure, by pre-coating the sheet with clear plastics or other separate binding materials, are discussed in the September, 1971 issue of "Book Production Industry", PP. 53–55, which discusses U.S. Pat. No. 3,560,290.

It has been known that in certain situations xerographic toners become tacky, softened or liquified. U.S. Pat. Nos. 2,638,416; 2,788,288; 2,917,460; 3,053,688; 3,262,806; 3,268,332 and 3,488,189 are examples of patents noting these toner characteristics. These characteristics are conventionally utilized for fixing the desired indicia onto individual sheets. Or they may be used for transferring images from one web to another, as in "strip out" imaging processes, e.g., U.S. Pat. No. 3,275,436. However, printing inks and toners are carefully selected and prepared to avoid and prevent any inter copy sheet adhension as soon as possible after the copy sheet printing is accomplished, because this would seriously interfere with normal printing operations and is considered highly disadvantageous in the art. Thus, toners or printing inks are not considered in the art as adhesives, and, in fact, intersheet adhesive properties are carefully avoided by ink or toner formulators.

In spite of, and contary to the teachings of the art, it has been found that a secure inter-sheet binding may be achieved utilizing only the conventional and commercially available printing indicia itself as the sole sheet binding agent, rather than adhesives or other separate bindings. Fusible xerographic toners have been found to be particularly suitable. By the term "fusible", (as used herein in connection with the indicia imparting material, such as xerographic toner) is meant a material which in its normal ambient state is non-adhesive (non-tacky), but is rendered sufficiently tacky for sheet adherence temporarily by heat or solvent vapors or pressure or some combination thereof. The desired toner material here is one that is refusible, i.e., easily rendered adhesive at least a second time, at any time after its initial fusing. Some examples of fusible and refusible xerographic toner compositions are disclosed in U.S. Pat. Nos. 3,609,082; 3,577,345; 3,590,000 and Re. 25,126. Suitable refusible xerographic toners are commercially available world-wide from the Xerox Corporation and its subsidiaries, and are already present in their existing xerographic machines.

A co-pending application Ser. No. 283,676 having the same title and assignee, by Gordon P. Taillie, filed Aug. 25, 1972, included a disclosure of details of the present invention, which was not claimed therein since it is the separate invention of the present applicant. This application is directed to a sheet binding process which is particularly suited for electrophotographic apparatus which does not inherently provide good solid area toner coverage, and therefore cannot readily provide a sufficiently high density of toner over a sufficiently wide binding area for good bonding.

The method of sheet binding disclosed herein overcomes the structural disadvantages of metal rivets and other penetrating bindings discussed above. It provides strong and sheet tear-resistant bindings having a larger binding area. The method of the invention enables the use of existing electrophotographic toner supply, dispensing, imaging and fusing apparatus without requiring any modifications. The only additional step required for the present process is a simple and non-critical re-fusing operation which can be performed at any time in conjunction with, or subsequent to, the indicia printing operation, and in any location. This refusing may be accomplished by various inexpensive and simple or commercially available apparatus, as described hereinbelow. Thus, it may be seen that the present process is particularly suitable for local sheet binding in offices or other existing xerographic machine locations.

The exemplary embodiment described hereinbelow discloses the incorporation of the process of the invention in an otherwise conventional exemplary xerographic process and apparatus. Accordingly, said processes and apparatus need not be described in detail herein, since various printed publications and patents and publicly used machines are available which teach details of various suitable exemplary electrophotographic and xerographic structures, materials and functions to those skilled in the art. Some examples are disclosed in the books *Electrophotography* by R. M. Schaffert, and *Xerography and Related Processes* by John H. Dessauer and Harold E. Clark, both first published in 1965 by Focal Press Ltd., London, England, and the numerous patents and other references cited in these books. All of these references are hereby incorporated by reference in the specification. Also incorporated by reference herein are the above-cited references from the adhesive binding art, for their showings of various sheet assembling, clamping and heating apparatus which may be utilized in the final steps of the present process. Accordingly, the present specification is specific to those details of the embodiment which represent a departure from the prior art, and further desired detailed description will be provided by the above references.

Further objects, features and advantages of the present invention pertain to the particular steps and details whereby the above-mentioned aspects of the invention are attained. Accordingly, the invention will be better understood by reference to the following description and to the drawings forming a part thereof, which are substantially to scale, wherein:

FIG. 1 is a perspective view of a document of bound sheets in accordance with the present invention;

FIG. 2 is a magnified cross-sectional partial view of the binding area taken along the line 2—2 of FIG. 1.

FIG. 3 is a perspective view of a transparent overlay with an optical mask, retaining an original as shown, for producing binding areas in xerographic copies of the original in accordance with the present invention;

FIG. 4 is a cross-sectional simplified plan view of an otherwise conventional xerographic machine showing several modifications which can be provided thereon for producing the process of the invention;

FIG. 5 is an enlarged top view of an optical mask which may be utilized in the apparatus of FIG. 4;

FIG. 6 is a perspective view of an exemplary re-fusing apparatus for the process of the invention, shown with an exemplary stack of sheets inserted therein; and

FIG. 7 is a simplified top view of the principal operating components within the apparatus of FIG. 6.

Referring to the drawings, there is shown in FIGS. 3–7 some examples of apparatus for performing the sheet binding processes of the invention. It will be appreciated that various steps of the process can also be performed manually or by other apparatus, including that disclosed in the previously cited references.

FIGS. 1 and 2 show one example of a completed article of manufacture in accordance with the present invention. Specifically there is shown a securely edge bound stack **10** of individual paper sheets **12**. The sheets **12** are bound only at a binding area **14**. This binding area **14** extends in a stripe along, or closely adjacent to, the entire left hand edge of all of the sheets **12** in the stack **10**. The binding areas are preferably located at the same position on each of the sheets **12**, so that with the sheets **12** aligned overlying one another, the binding areas **14** are also so aligned. Each binding area **14** is substantially continuously covered and occupied by a corresponding high density area **16** of fusible xerographic toner **18**. Preferably each sheet **12** has at least one such high density area **16**. The toner **18** of this high density area **16** is the same toner **18** as provides the indicia **20** on the sheets **12**, and it is preferably provided in the same step and at the same time as the imaging of the indicia **20**.

As may be seen particularly from the magnified cross-sectional view of FIG. 2, the inter-sheet binding consists solely of the high density areas **16** of toner **18** being commonly fused between immediately adjacent sheets **12** at the binding area **14**. It may be seen that the toner **18**, which was initially prefused into the binding areas of the individual sheets **12**, is additionally refused into the sheet immediately above or below it. The toner is refused into all of the sheet surfaces in the case of conventional porous paper, as shown, to form a strong interlocking bond.

The strength of the inter-sheet bond is a function of the area, density, and degree of fusing of the xerographic toner between adjacent sheets. By increasing these parameters the inter-sheet bond can be made substantially stronger than the tear resistance of the sheet material itself. Correspondingly however, by reducing one or more of these parameters in the binding process there can be provided an inter-sheet bond which is sufficient to normally retain the sheets together, but yet which allows removal of individual sheets without sheet tearing. I.e., a pad type of binding can be provided wherein one or more sheets can be pulled off the stack neatly, with the separation occuring at the respective inter-sheet toner bond.

It will also be noted that the stack **10** may be additionally bound by conventional staples, rivets or other mechanical fastening means, as shown by exemplary staple **22** in FIG. **1**. If done in the binding areas, this provides a binding which is far stronger than such conventional mechanical binding means can provide in themselves. This is because when such mechanical fasteners penetrate the sheets in the stack only within the fused binding areas, they are not limited by their normal stress concentrations and small area sheet strength limitations. The stack area around the area of fastener penetration is bonded together and reinforced by the re-fused toner and strongly resists sheet tearing as a unit. These advantages similarly apply if apertures through the sheets are desired at the binding areas for ring binding or the like. It will be appreciated that combinations with mechanical fastenings means are not required and that the present process can provide sufficient binding strength to be the sole binding means for permanent binding.

The binding area **14** of FIGS. **1** and **2** is a contiguous single edge binding area. However, it will be appreciated that the binding area may be in only one corner of the sheets, for example, or there may be several separate binding areas rather than a single one.

Referring to FIG. **4**, there is shown therein by way of example, one type of conventional xerographic apparatus. The process of the invention may be performed thereon utilizing this apparatus in its conventional mode of operation. Thus, an indicia bearing original **24** here is conventionally optically imaged onto a charged photoreceptor surface **26** to form an electrostatic image of said indicia thereon. This electrostatic indicia image is conventionally developed by attracting an electrostatically attractable and fusible xerographic toner **18** to said electrostatic image, which attracted toner 18 is then fused onto the desired copy sheets 12. (As is well known, in certain other types of xerographic processes using photosensitive treated paper, the charged photoreceptor is integral the copy sheet.) The fusing of all of the toner 18 onto the copy sheet is accomplished by a conventional fusing operation 30 in the xerographic apparatus. The completed image copy sheets 12 are then deposited at the output in a catch tray 32 or other suitable sheet receptor which provides assembly of the copy sheets in an overlying stacked uniform relationship.

Considering now FIGS. 3–5, there are illustrated thereon examples of differences in otherwise conventional xerographic sheet processing which enable the sheet binding process of the invention to be accomplished. FIG. 3 illustrates an optical mask 34 which functions as an overlay to the indicia bearing original during imaging in the apparatus of FIG. 4, or other xerographic apparatus. The optical mask 34 is provided by an opaque area 36 on an otherwise fully transparent clear plastic jacket 38 into which the original 24 is simply inserted. This jacket does not obstruct indicia imaging of the original, unlike the "half tone" jackets in use for breaking up indicia areas for xerographic reproduction. The opaque area 36 corresponds in proportion, size, location and area to the desired binding area 14 on the copy sheet. (With a one to one reduction it will be identical.) I.e., the optical mask 34 is dimensioned so as to provide a high density binding area 16 of toner on the copy sheet of the dimensions previously discussed.

The opaque area 36 is located on the side of the jacket 38 which is between the original and the photoreceptor, i.e., in the optical path therebetween, and outside of the indicia area. Thus, in the xerographic imaging process there is thereby formed an intense additional electrostatic charge image on the minor area of the photoreceptor which corresponds to the desired binding area on the copy sheet. The mask provides in itself a very high contrast multiplicity of closely spaced alternating light and dark images to the photoreceptor. This additional image is in addition to the electrostatic indicia image, and is formed at the same time and by the same apparatus. Accordingly, in the same operation in which toner 18 is attracted to the electrostatic indicia image, the high density area 16 of toner is attracted to the additional minor image area and additionally imparted to the copy sheet at the binding area 14. This additional toner area is fused along with the indicia in the conventional fusing operation 30.

FIGS. 4 and 5 illustrate a different type of optical masking operation to achieve the same result of forming the high density area 16 of toner at the binding area 14. This optical mask 40 is shown in an enlarged top view in FIG. 5, and in position in a side view in FIG. 4. The exemplary mask 40 is a plate reciprocally movable in and out of the optical path between the original 24 and the photoreceptor at one edge thereof. When so inserted, it functions in the same manner as described above for the optical mask 34. It may be inserted manually or by an automatic apparatus such as the electrical solenoid 42 shown.

It has been found by the present inventor that both the optical masks 34 and 40, should be finely optically apertured if good toner binding is to be achieved in the many xerographic machines that do not provide solid area development. That is, the optical masks are preferably made up of a multiplicity of small opaque areas separated by small transparent spaces in between. For a desired binding area 14 in the form of a stripe or band as illustrated, the optical mask is preferably made up of a multiplicity of closely spaced opaque lines. Preferably these lines are approximately 0.05 to 3.2 millimeters (0.002 to ⅛ inch) wide and are spaced apart by approximately 0.05 millimeters (0.002 to 0.003 inches or slightly greater), whereas the entire band is preferably wider than approximately 6.35 millimeters (¼ inch). This band width can provide good binding with the process herein even in xerographic machines with edge development and poor solid area toner coverage. In a machine providing good solid area development a solid toner band as narrow as 3.2 millimeters (⅛ inch) can provide a sufficient binding area.

The use of an apertured optical mask as taught here takes advantage of, and utilizes for the purpose of the invention, the phenomenon of "edge development" in electrophotography. This phenomenon per se is well discussed in the previously cited text references and accordingly need not be discussed herein. The result of a mask of this apertured configuration with edge development is a much higner toner concentration over what would otherwise be the hollow (low toner) interior of solid areas. Thus, a much higher overall toner density, and much better bond, is provided in the desired binding areas than would be provided by a solid area mask. Closely spaced dots in these dimensions and spacings rather than lines may also be used for the same purpose, although lines are preferred.

An alternative method by which the desired optical mask may be provided in the path between the original and the photoreceptor is to simply preprint a finely apertured dark area on the original. As a further alternative, the copy sheets themselves may be preprinted with sufficient toner in the desired binding areas. These methods of course require an additional step unless preprinting is required for other reasons.

Considering next the exemplary ways in which the high density binding areas 14 of toner 18 on the individual sheets 12 are bound together to form an integral stack 10, as previously described the sheets are assembled together in a directly overlying relationship in a position in which they are to be bound. It is not essential that all of the binding areas directly overlie one another although this is preferable. At the catch tray 32 of FIG. 4 there is provided an exemplary pair of pressure platens or dies 46 and 48 located at the lower end of the catch tray where one edge of the sheets commonly abuts a stack stop. They comprise here one fixed heated platen 46 and one movable heated platen 48, located respectively at opposite sides of the stack 10. The platens 46 and 48 provide re-fusing for binding between adjacent sheets by heating the stack at the binding area 14 sufficient to render the high toner density area 16 on the sheets (only at the binding areas) sufficiently tacky to adhere between adjacent sheets, while simultaneously pressing the binding areas 14 together under pressure between the platens 46 and 48. The platen 48 is moved with pressure down against the top of the stack. This pressure is sufficient to remove air spaces between the sheets at the binding areas, and to provide good inter-sheet toner transfer, including improving the flow of toner from its carrier sheet into the adjacent sheet surface. The heating is continued until the toner on at least one sheet is softened sufficiently to adhere to the next adjacent sheet for each of the number of sheets being bound. Preferably, the stack **10** is further held between the dies for a time period after the heating is terminated sufficiently to allow the toner to substantially re-solidify by cooling.

The platens **46** and **48** are shown here with schematic representations of conventional electrical heating coils in the platen surface to provide the re-fusing heat. However, it will be appreciated that numerous other fusing means and processes may be utilized including those described in the above-cited references.

While, as described above, all of the sheets to be bound in a single stack may be first assembled together and bound simultaneously in a single binding re-fusing step, other variations are possible. For example the re-fusing process may be repeated for each individual sheet to be bound. One way this may be accomplished is for the binding area of the uppermost sheet in the stack to be radiant heated to maintain the toner therein sufficiently adhesive, the next sheet for the stack to be individually placed on the stack with a binding area contacting the stack, and this single additional sheet to be bound to the stack by downward movement of the platen in synchronism with the addition of the sheet. By repeating this step for each additional sheet, as many additional sheets as are desired may be bound to the same stack without requiring heating of the entire stack. Correspondingly, or in combination, individual sheets may be added and bound to the stack one at a time by rendering or maintaining the toner area on the added sheet sufficiently tacky during the time that it is added to the stack and clamped by the platen thereon. A thermal shield **50** extending from the fusing operation **30** down over the catch tray **32** is illustrated here by way of an example for effecting the latter step by maintaining the toner area **16** warm and tacky from the original fusing operation **30** for the brief time needed to place it over the stack and press it down thereon.

FIGS. **6** and **7** illustrate the exterior and interior details respectively of a further exemplary apparatus **52** for performing the final re-fusing step for binding described above. As may be seen from FIG. **6**, the apparatus **52** is designed to accept the stack **10** of sheets **12** vertically downwardly therein and to align the lower edges thereof for binding as a single bound stack. As may be seen from FIG. **7** this may be accomplished by a relatively simple apparatus **52** comprising a stationary platen **54** operated against by an opposing moving platen **56.** The moving platen **56** is driven under pressure to compress together the binding areas **14** of the stack **10** by a rotatably driven cam **58.** The cam **58** causes a cam follower **59** to reciprocate, and it in turn moves the moving platen **56** through coil compression springs **60.** The springs **60** restrict the amount of force which can be applied to the moving platen **56,** and thereby prevent jamming of the machine. However, an increased thickness of the stack **10** will cause greater compression of the springs **60** and therefore a desired greater compression force to be applied to the stack. Electrical heating elements as shown may also be provided here to heat the platens. Additional heating means can also be provided in the bottom surface against which the stack abuts.

The above described apparatus **52** is for the purpose of providing the application of both heat and pressure for stack binding. It will be appreciated that depending on the type of xerographic toner selected, that pressure alone may be sufficient, or that vapor or other known fusing methods may be provided. It will also be appreciated that numerous other apparatus may be utilized, such as pressure dies in the form of continuous rollers, etc. Further, pressure can be, but need not necessarily be, applied before, while, or after the toner is heated.

Any type of original image indicia may be utilized with the present process, whether hard copy, microfilm, microfiche, graphic, or alpha numeric, since the binding process does not interfere in any way with normal indicia imaging or printing except at the selected binding areas. Likewise, almost any copy paper may be utilized. For example, the present process may be utilized to provide bound demand-printed paper copies of microfilm reports, texts or the like. It is especially suitable for direct on-line binding of pre-collated output sets from high speed machines.

For microfilm or other reversal image input, it will be appreciated that an opaque image mask will not be suitable. In this case the additional image area for toner binding can be provided by additional light sources imaged through apertures corresponding to the above-described masks.

It will also be noted that either one or both of the immediately adjacent (overlying) binding areas may have the pre-fused toner binder areas thereon. If both adjacent surfaces have high density toner areas **16,** this will give an even stronger bond since more binding toner **18** is available in the inter-sheet space, and also since deeper toner penetration of both sheets may have been provided in the original fusing in this manner.

It will also be noted that in situations where there is not an esthetic problem, that it is possible with the present process to print or indicia a number of additional unused binding areas in addition to the binding area which may eventually be utilized. In fact, by printing binding areas on all copies produced whether intending them to be bound or not, subsequent binding together of any of the sheets may be readily accomplished at any time by completion of only the re-fusing step of the above-disclosed process. The black binding areas which would be exposed on the unbound copies would not be objectionable in many situations, since they would occupy only a small area of the sheet margin outside of the normal indicia-occupying area. Thus, for convenience, it is also possible to completely mask both edges of the original so as to provide a substantial toner area along both edges of the copy sheets. Only the one edge which is clamped and subjected to re-fusing will be a binding area. There is no binding effect by these further high density areas of toner, since if they are not re-fused in the re-fusing step, they will not bind the sheets together.

Providing binding areas at both sheet edges may be particularly desirable in the case of duplex or pseudo-duplex copying where the desired binding areas may be at alternating sides of the respective sheets. In pseudo-duplex output format, where two sheet folds of material are bound together at every other fold line to provide the individual duplex pages, it may be desirable to place the binding areas on both sides of both edges of each sheet.

In situations where the esthetic factor of exposed black toner areas is a problem, it will be noted that all the binding areas which are bound are not visible except for binding areas exposed on the upper or lowermost sheets of the stack. These can be eliminated simply by ensuring that the upper and lowermost sheets to be bound only have binding areas facing the stack.

Several stacks **10** can be simultaneously bound by a modification of the process herein. A large common assemblage of all the sheets for several stacks can be formed, interspersed with one or more sheets having no adjacent inter-sheet binding area thereon. These interspersed sheets are located between the desired individual bound stacks. The entire assemblage can then be subjected to the toner re-fusing step. The interspersing sheets will prevent inter-sheet binding to themselves, but not interfere with the binding together of all of the other sheets with toner binding areas. Thus, in a single binding operation, several bound stacks can be simultaneously produced without adhering to one another. Note that these interspersed non-binding sheets can be provided by the last sheet of one stack and the first sheet of the next stack having no binding areas on their outward facing surfaces, which is also desirable esthetically. This elimination of binding areas on selected sheet surfaces can be provided automatically, for example, by programmed actuation of the solenoid **42** to remove the imaging light mask **40** for preselected sheets.

Note that the term "sheet" as used in the specification and claims herein is defined (conventionally) as including both individual cut sheets and also sheet segments of continuous web or fan fold or accordian fold paper or the like, whether burst or unburst. The subject method is applicable to those machines in which the paper is roll fed and is cut or folded into its individual sheets only after the toner has been applied and first fused into the binding areas.

In conclusion, it may be seen that there has been disclosed herein a novel and improved sheet binding method, and a bound stack produced therefrom, having numerous advantages in both simplicity, economy, and fastening security. The exemplary embodiments described herein are presently considered to be preferred; however, it is contemplated that further variations and modifications with the purview of those skilled in the art can be made herein. The following claims are intended to cover all such variations and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In an electrophotographic process wherein an indicia bearing original is optically imagable onto a charged photoreceptor surface to form an electrostatic image of said indicia thereon, and wherein this electrostatic indicia image is edge developable by attracting an electrostatically attractable and fusible electrophotographic toner to the edges of said electrostatic image, which attracted toner is then fusible onto the desired copy sheet; the improvement comprising the steps of:

optically forming an intense electrostatic charge image over at least one selected minor area of said photoreceptor by applying a multiplicity of small closely spaced alternating high contrast light and dark images to said photoreceptor over said minor area of said photoreceptor;

attracting an overall high density of the same said fusible electrophotographic toner to said selected minor area by edge development of said alternating closely spaced light and dark images;

fusing said high density toner area to said copy sheets at at least one selected minor binding area of said sheets;

assembling two or more of said copy sheets in a stacked relationship; and

while said sheets are so assembled, re-fusing said toner between said adjacent sheets only at said binding areas sufficiently to achieve inter-sheet binding by commonly fusing said toner between adjacent sheets only at said binding areas.

2. The process of claim **1** wherein said light and dark images are consistently spaced apart by a distance corresponding to the effective edge development distance of said photoreceptor.

3. The process of claim **2** wherein said light and dark images are a band of closely spaced lines and said binding area is the image of said band extended along at least one edge of said sheets.

4. The process of claim **1** wherein said light and dark images are applied by inserting a finely multiply apertured optical mask between said indicia bearing original and said photoreceptor.

5. The process of claim **1** wherein said mask is inserted by inserting a transparent overlay bearing said mask.

6. The process of claim **4** wherein said optical mask is inserted by inserting said original into a transparent folder bearing said optical mask and positioning said original in said folder so that no indicia or said original is masked by said optical mask.

7. The process of claim **3** wherein said lines are applied spaced apart by approximately 0.05 millimeters and are between approximately 0.05 to 3.2 millimeters in width, and wherein said band is greater than approximately 6.35 millimeters in width.

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