Aug. 31, 1965 H. M. MONAGHAN 3,203,074

SHEET CLAMPING ARRANGEMENTS

Filed June 4, 1962 2 Sheets-Sheet 1

FIG. 1

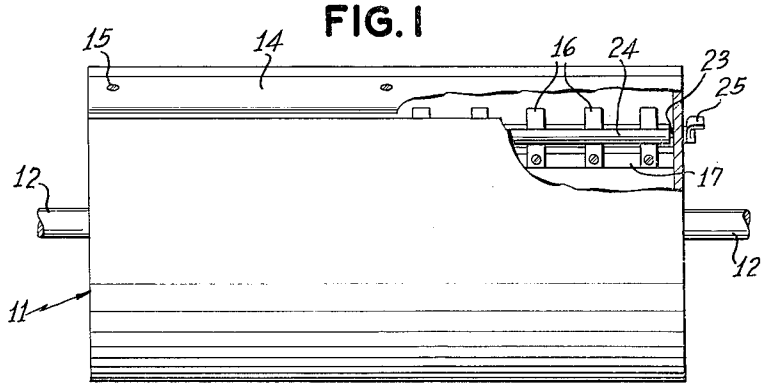

FIG. 2

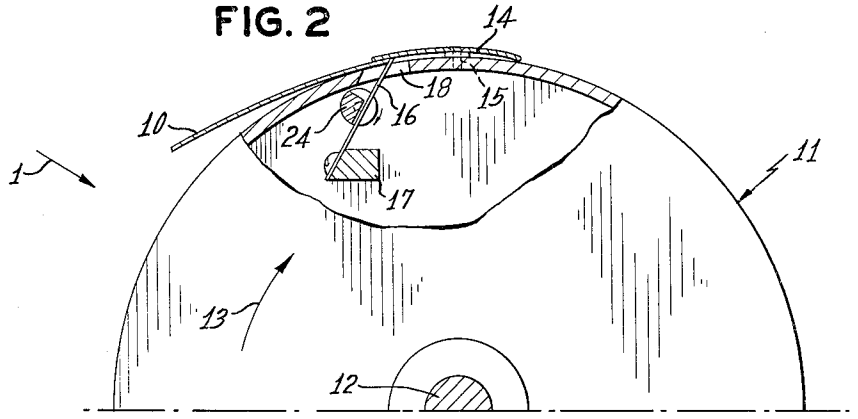

FIG. 3

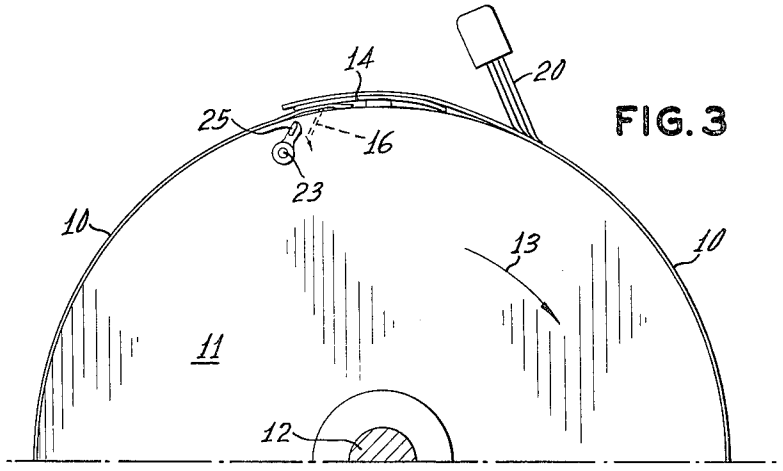

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FIG. 4

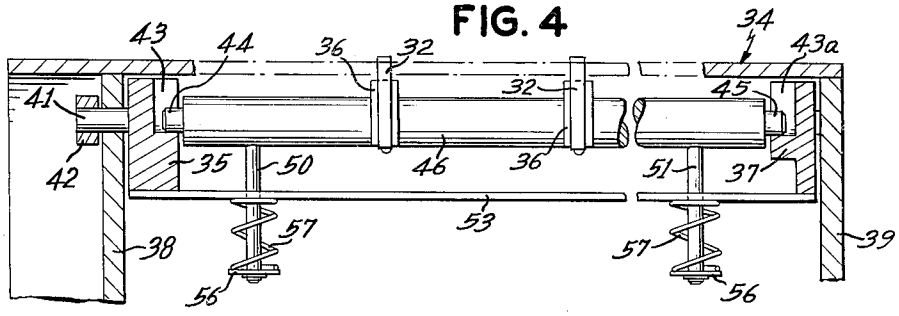


FIG. 5

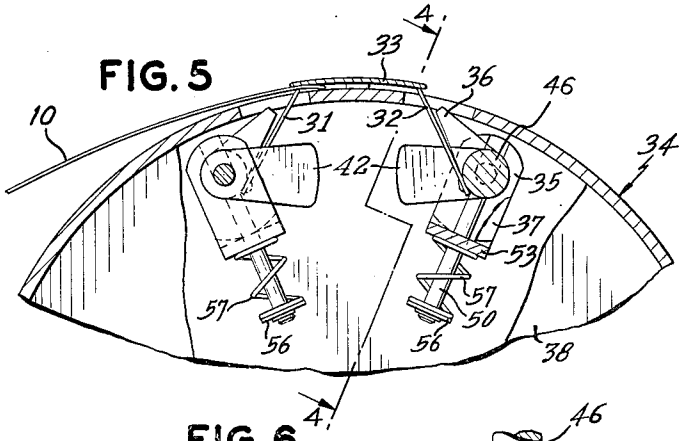


FIG. 6

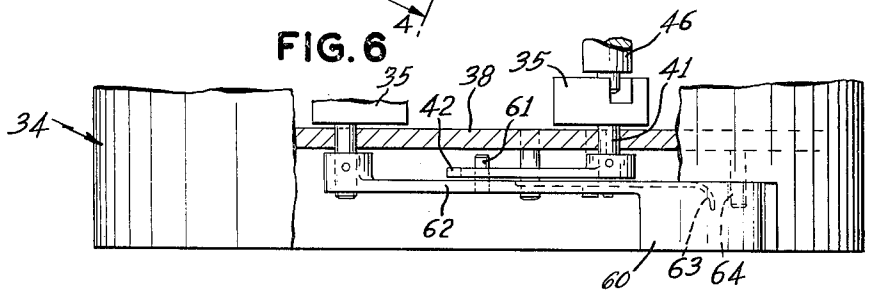
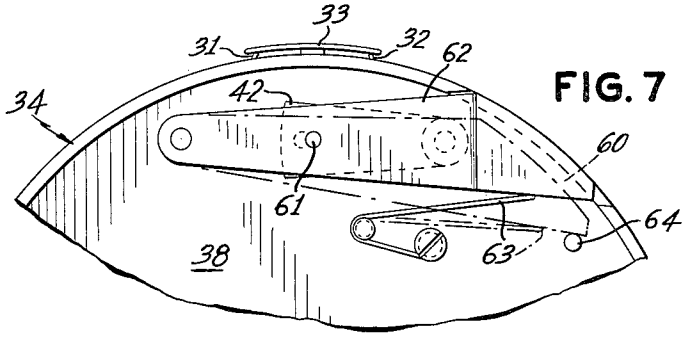


FIG. 7



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SHEET CLAMPING ARRANGEMENTS

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7 Claims. (Cl. 29—118)

This invention relates to a sheet clamping or mounting arrangement, particularly adapted for clamping a flexible sheet on a cylindrical carrier or support but not limited thereto.

The object of the invention in general terms is to provide an improved arrangement for clamping a sheet on a supporting surface in which the sheet is secured in the desired mounting position by merely locating or pushing the edge of the sheet to the mounting position, without the necessity for manipulating an auxiliary lever, button or other operating device.

Another object of the invention is to provide frictional means for gripping the edge of sheet material solely in response to the insertion of the material to the mounting position on a carrier or support.

A further object of the invention is to provide a sheet clamping arrangement of this character which is adapted to clamp both ends of the sheet on a cylindrical carrier or support.

A further object of the invention is to provide, in a clamping device for clamping sheet material, means defining a clamping surface for an edge of the sheet material, and means such as leaf spring fingers having their free ends in opposed relation to or engaging said clamping surface to grip the edge of said sheet material when it is inserted between the spring fingers and said clamping surface.

A still further object of the invention is to provide clamping means in a cylindrical carrier or support for sheet material, said cylindrical carrier or support being provided with a narrow slot, consisting of a series of flexible spring fingers or the like for gripping the edge of sheet material automatically when it is inserted into said slot; and if desired, manually operated means for releasing the sheet material from the gripping means.

Still another object of the invention is to provide, in connection with means for clamping sheet material on a rotatable carrier or support, means to tension the sheet material or increase the clamping effect in response to the centrifugal forces produced upon rotation of the carirer or support.

In the following description of the invention and in the appended claims, the term "leading edge" is that edge of the sheet which lies ahead of the "trailing edge" in the rotation of the sheet on a rotating carrier. Normally the leading edge of the sheet is secured to the cylindrical carrier by suitable gripping means and the trailing edge may be left free, although it is usually prevented from flapping by wiping contact brushes, or equivalent means; or the trailing edge may also be clamped to the surface of the cylindrical support.

The clamping arrangement of the invention is particularly adapted to hold sheet material on the rotatable carrier or support of a facsimile transmitter or recorder but obviously is not so limited, since the configuration of the support ordinarily does not change the character of the clamping means. The so-called "drum" type facsimile apparatus ordinarily employs clamping means for either the leading or both the leading and trailing edges of the transmitter copy and of the recorder sheet. However, while reference has been made to facsimile apparatus, it will be obvious that the invention will find application in various other apparatus, wherever sheet material is to be temporarily mounted in position on a supporting surface.

In accordance with the invention, the clamping arrangement comprises one or more resilient or leaf spring fingers engaging a clamping strip at such an angle that the edge of the sheet material may be pushed between the ends of the spring fingers and the clamping strip but will be securely held so that it cannot be withdrawn until the spring fingers are flexed or biased away from the gripping position. In the case of a cylindrical carrier for facsimile apparatus, the clamping strip may be mounted on the exterior of the cylindrical carrier in a manner to define a longitudinal clamping area or surface opposite a slot in the drum surface. The resilient gripping means, such as a leaf spring, may be mounted inside of the cylindrical carrier with its free end extending through the slot in the wall of the cylinder at a predetermined acute angle to and engaging the clamping surface on the clamping strip. In a preferred arrangement, a series of independent leaf spring members may be mounted in a row, the ends of said members engaging the clamping surface of the clamping strip at an angle which permits the edge of the sheet material to be pushed past the ends of the resilient members to the gripping position. Where both the leading and trailing edges of the sheet material are to be secured in position, two adjacent parallel sets of clamping or gripping fingers may be provided to engage the respective ends of the sheet material.

The inner fixed ends of the leaf spring fingers are mounted on a fixed support, and suitable means such as a longitudinal cam rod is provided for simultaneously lifting all of the spring fingers away from frictional engagement with the sheet, to release the sheet when it is desired to remove it from the carirer or support. In a further modification, the inner ends of the leaf spring fingers are mounted on a radially movable support which is responsive to the rotation of the carirer or support so as to increase the tension on the sheet material or the clamping force or friction as the rotational speed of the cylindrical carrier increases.

Other objects and advantages of the invention will be apparent from the following description of the preferred embodiments shown in the accompanying drawings, wherein

FIG. 1 is a plan view of the clamping arrangement on a cylindrical carrier or support for sheet material, taken in the direction of the arrow "1" of FIG. 2, with a part of the carrier broken away to expose the internal construction;

FIGS. 2 and 3 are sectional and end views of the cylindrical carrier or support of FIG. 1, showing the detailed construction of clamping and releasing means for only one edge of the sheet material;

FIGS. 4 and 5 are detail views showing a modification wherein both the leading and trailing edges of the sheet material are clamped on the cylindrical support and the sheet gripping means is responsive to centrifugal force produced by rotation of the cylindrical carrier, FIG. 4 being a sectional view taken as indicated at line 4—4 of FIG. 5;

FIG. 6 is a fragmentary view showing another form of manual operating or release lever at the end of the cylindrical support for actuating the clamping means shown in FIGS. 4 and 5; and

FIG. 7 is a side view of the release lever shown in FIG. 6.

Referring to FIGS. 1 to 3 of the drawings, a clamping arrangement according to the invention is shown for securing a sheet 10 upon a rotatable carrier or support 11 of a facsimile machine, only so much being shown of the machine as is necessary for an understanding of the invention. It is assumed that the carrier or support 11 rotates on a shaft 12 in the direction of the arrow

13, and the leading edge of sheet 10 is to be releasably attached to the surface of the support 11. Recording or scanning devices, and means for rotating said carrier may be of conventional character. The clamping arrangement shown includes an elongated clamping strip 14 which is attached to the surface of the cylinder 11 by means of screws 15 or in any other suitable manner. The underside of the clamping strip 14 is slightly spaced as by spacers, as shown from the external surface of the cylinder 11 in order that the edge of the sheet 10 may be inserted underneath said strip (see FIG. 2). A plurality of clamping members 16, preferably in the form of thin, resilient, leaf spring fingers, are mounted upon and attached by screws as shown to a longitudinal supporting bar 17 with the free ends of the clamping members in alinement and projecting through a slot 18 in the circumference of the cylinder 11 into firm engagement with the underside of the clamping strip 14. The edge of the sheet 10 which is to be mounted on the cylinder 11 is inserted under the edge of the clamping strip 14 and pushed between said strip and the ends of the clamping members 16. The edge of the sheet 10 which is inserted in this manner is securely held by frictional contact between the sheet, the clamping strip 14 and the clamping members 16.

As shown, the leaf spring fingers or clamping members 16 are disposed at an obtuse angle to the surface of the clamping strip 14 in order to permit the edge of the sheet 10 to be pushed between the fingers and the clamping strip, and then grip and lock the sheet against withdrawal. In the case of a sheet 10 of very light, flimsy material, the spring fingers are made of thin flexible material which offers only slight resistance to pressure, and the fingers are mounted at an angle of approximately 60° with the surface of the clamping strip. Ordinarily an elastic metal or alloy of two or more metals is preferred in order to obtain both the requisite lateral flexibility and longitudinal stiffness or strength. The same construction can be used for clamping sheets of various thicknesses and varying degrees of stiffness. However, in the case of thick, heavier or stiffer material, the leaf springs 16 are preferably made heavier and the angle between each spring and the surface of the strip 14 may be increased until the optimum gripping effect is secured.

As shown, the clamping arrangement may be used for clamping only the leading edge of the sheet 10, the trailing edge being held against flapping by the usual wiping brushes 20 or similar means as well known in the art. It will be evident that with the clamping arrangement embodying the invention, the sheet 10 may be easily mounted in place, with both hands free for holding and inserting the sheet since no manipulation of the usual auxiliary lever or button connected to a clamp bar is necessary during the mounting operation.

In order to release the sheet 10 from the support 11, the outer or locking ends of the clamping fingers 16 are flexed from their normal gripping position to deflect or release the ends away from the surface of the sheet 10. Any suitable means may be employed for this purpose, such as a longitudinal cam rod 23 (see FIGS. 1 and 2) extending along the length of the carrier and having a suitably shaped cam member 24 thereon in position to engage the ends of the clamping fingers 16 when the cam rod is turned, to release the copy from the carrier or support. As shown, the cam rod 23 is provided with a manually operable release lever 25 on the outside of the cylindrical support 11 for releasing the sheet 10 from the support when desired.

In FIGS. 4 and 5 of the drawings, a modified construction in accordance with the invention is shown in which both the leading and trailing edges of the copy sheet 10 are securde in position on a cylindrical support or carrier 34. In this case, duplicate sets of leaf spring fingers 31 and 32 are provided at each side of the stationary external clamping strip 33. Mounting of the sheet 10 are secured in position on a cylindrical support the leading edge between the spring fingers 31 and the adjacent edge of the clamping strip 33, then wrapping the sheet around the drum and inserting the trailing edge between the spring fingers 32 and the opposite edge of the clamping strip 33. The construction is similar to that shown in FIGS. 1 to 3, except that the spring clamping fingers, instead of being attached to a stationary supporting member, are arranged to be responsive to the centrifugal forces developed by the rotation of the cylindrical carrier or support 34. It is a feature of this construction that the centrifugal forces on the supports for the spring fingers 31 and 32 are utilized to tension the sheet material, or tighten the grip of the clamping device on the edges of the sheet by increasing the clamping pressure between the spring fingers and the stationary clamping strip 33.

FIGS. 4 and 5 show by way of example a preferred construction in which, in the case where both ends of the sheet material are secured to the cylindrical carrier, each row of spring fingers or clamping members 31 and 32 is carried on radially slotted supporting members, such as pivoted blocks 35 and 37 mounted on the end walls 38 and 39 at opposite ends of the cylindrical carrier 34. As shown, the spring fingers 32 are attached to the supporting structure adjacent pivoted actuating or release members 36 which are adapted to flex the clamping springs and release the sheet from the carrier. The members 36 are tilted to flex the ends of the spring fingers 32 by tilting the pivoted supporting blocks 35 and 37 through a shaft 41 and attached operating or release lever 42. The supporting blocks 35 and 37 may be provided for example with radial grooves or recesses, as indicated at 43 and 43*a* respectively, forming radial guide slots for the end portions 44 and 45 of a longitudinal supporting bar 46 which carries the spring fingers 32 and associated release members 36. Projecting posts 50 and 51 attached to the supporting member 46 extend through a cross bar 53 which connects the two pivoted supporting blocks 35 and 37 so that they turn in unison when the lever 42 is rocked.

It will be apparent that a tilting movement of the supporting members 35 and 37 causes a corresponding rocking or tilting movement of the supporting bar 46 to release the copy when the actuating members 36 engage the upper or tip ends of the clamping fingers 32. The supporting member or bar 46 is normally biased toward the axis of the cylindrical carrier 34 by springs 57 interposed between the cross bar 53 and the end caps 56 on the posts 51. The ends of the supporting bar 46 are thus normally held in the bottom of the slots 43 and 43*a*, and in this position the clamping fingers 32 exert a light or normal pressure upon the sheet 10 and the clamping strip 33. However, during rotation of the rotatable carrier 34, the centrifugal force exerted upon the supporting bar 46 produces a radial outward movement of said bar against the tension of the springs 57, thus increasing the clamping pressure or the tightness with which the clamping fingers 32 engage the sheet 10, and also pulling the sheet tight around the circumference of the carrier 34 in case of any slack or looseness. The spring fingers 31 on the opposite side of the sheet may be mounted in the same manner, as shown in FIG. 5, and thus provide the same advantages as a result of the centrifugal force exerted on the supporting member therefore during the rotation of the cylinder 34.

As shown in FIGS. 6 and 7, the release mechanism for tilting the support members 35 and 37 and releasing the sheet 10 from the cylinder may be arranged to conjointly or simultaneously release both ends of the sheet by operation of a single manually operable lever. Thus one of the release or operating levers 42 of the respective clamping assemblies may be extended as indicated at

62 and a projecting stud 61 may be employed to connect the levers 42 and 62. The outer end of the lever 62 extends to the periphery of the cylindrical carrier 34 to form a thumb-piece 60 for facilitating manual release of the sheet 10. With this construction, when the lever 62 is depressed against a return spring 63 by pressing down the thumb-piece 60, both release levers 42 and 62 are effective to twist or tilt the release members 36 through the supporting blocks 35 for the longitudinal bars 46, and thus conjointly and simultaneously bend the tip ends of the clamping fingers 31 and 32 away from the sheet 10 to release it from the carrier. As shown, the lever 62 is combined with the manually operable thumb-piece 60 for effecting release of the sheet, and a pin or stop member 64 limits the movement of the levers 42 and 62; however any suitable means for releasing the sheet by flexing the spring fingers 31 and 32, either separately or conjointly, may be employed in lieu of the specific release arrangement illustrated.

It will be evident that the present invention provides an arrangement whereby sheet material may be easily and quickly mounted on a support, attached securely either at one edge only or at both the leading and trailing edges. The outstanding advantage is the novel gripping means by which the edge of the sheet is mounted and firmly gripped merely by the act of positioning said edge on the support or carrier. In the case of a rotating carrier, in one embodiment of the invention centrifugal force is utilized to enhance the clamping pressure or force on the mounted sheet material, or to tighten the sheet around the circumference of the drum or carrier.

While specific embodiments of the invention have been described in detail for the purpose of explaining the underlying principles thereof, it will be apparent to those skilled in the art that the form, size and arrangement of the sheet clamping arrangements shown may be materially changed without departing from the scope of the invention; and it is contemplated that such changes may in some instances involve more than the substitution of mechanical equivalents.

What is claimed is:

1. In a cylindrical carrier for sheet material, in combination,
- an elongated fixed clamping strip for said sheet material mounted adjacent the external cylindrical surface of and extending parallel to the axis of said carrier so as to provide a small space between the surface of the support and the clamping strip,
- a plurality of independent flexible leaf spring fingers arranged side-by-side along the length of the clamping strip and engaging the underside of said clamping strip,
- said spring fingers being disposed at such an angle with the clamping strip as to permit an edge of the sheet material to be inserted by the act of sliding it between the spring fingers and the strip, and
- means for flexing the spring fingers to release the sheet material, said means including a pivoted cam rod engaging said spring fingers.

2. In a clamping device for clamping sheet material on a rotatable carrier, in combination,
- means defining a clamping surface for an edge of said sheet material, a member mounted on said carrier for movement in response to the centrifugal force generated by rotation of said carrier, and
- a series of leaf spring fingers fixed at one end on said member, with the free ends thereof in opposed relation to said clamping surface to grip the edge of said sheet material between the spring fingers and said clamping surface.

3. In a cylindrical rotatable carrier for sheet material, in combination,
- means forming a supporting surface with a linear clamping area for the sheet,
- at least one leaf spring substantially perpendicular to said area of the supporting surface, and
- in contact therewith normally at its tip end and disposed at such an angle to the supporting surface as to permit insertion but not withdrawal of the sheet material from said clamping area, and a movable support for said leaf spring arranged to be operated by centrifugal force during rotation of said carrier to increase the clamping pressure between said spring and the sheet material.

4. In a cylindrical carrier for sheet material, in combination,
- clamping means for said sheet material comprising a series of flexible spring fingers extending along the length of said cylindrical carrier,
- said fingers extending through a slot in said carrier or support,
- means for supporting the inner ends of said spring fingers in fixed relation to said carrier or support,
- a clamping strip disposed adjacent to and spaced slightly from the outer surface of said carrier, in a position to be engaged by the free ends of said spring fingers, and
- means including a cam rod adjacent the free ends of said spring fingers and extending the length of said carrier or support for simultaneously deflecting the spring fingers to release sheet material clamped between said spring fingers and said clamping strip.

5. In a rotatable carrier for sheet material, in combination,
- a longitudinal clamping strip mounted adjacent to and spaced slightly from, the external surface of said carrier,
- a series of spring fingers mounted side-by-side inside said carrier or support with free ends thereof engaging said clamping strip to secure an edge of the sheet material inserted between said spring fingers and said clamping strip to the carrier,
- said spring fingers being disposed at an acute angle to the opposed face of said clamping strip to permit the edge of the material to be inserted between the spring fingers and the clamping strip by pushing of said material against said spring fingers,
- an elongated support member to which the inner ends of said spring fingers are attached, and
- means for mounting said support member for radial movement in response to centrifugal force as the carrier is rotated whereby the pressure of the spring fingers on the edge of the sheet material is increased.

6. In a rotatable carrier for sheet material, in combination,
- clamping means for the leading and trailing edges of material from said clamping area, and a movable said sheet material comprising a clamping strip mounted on said carrier and slightly spaced from the external surface thereof to receive the edges of the sheet material, and two rows of leaf spring fingers projecting through the surface of said carrier and disposed for clamping contact with said edges, and
- manually operable means for conjointly flexing said leaf spring fingers to release both ends of said sheet material.

7. In a rotatable carrier for sheet material, in combination,
- means supporting said carrier for rotation,
- sheet-clamping means for holding an edge of said sheet material against said carrier or support, said sheet-clamping means including a clamping strip mounted on said carrier and spaced slightly from the external surface thereof, and a clamping member cooperating with said clamping strip to hold an edge of said sheet material on said carrier, and
- means for increasing the clamping pressure on said

sheet material as a result of the rotation of said carrier,

said last-mentioned means comprising a radially movable support for said clamping member.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,203,074

August 31, 1965

Hugh M. Monaghan

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 35, for "carirer" read -- carrier --; column 3, line 74, for "securde" read -- secured --; column 4, line 3, for "sheet 10 are secured in position on a cylindrical support" read -- sheet 10 in position on the carrier is effected by inserting --; lines 67 and 68, for "therefore" read -- therefor --; column 6, line 53, strike out "material from said clamping area, and a movable".

Signed and sealed this 15th day of March 1966.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents