

T 8113

X 8029

May 18, 1948.

P. B. STREICH

2,441,912

SHEET SEPARATING DEVICE

Filed July 23, 1946

2 Sheets-Sheet 1

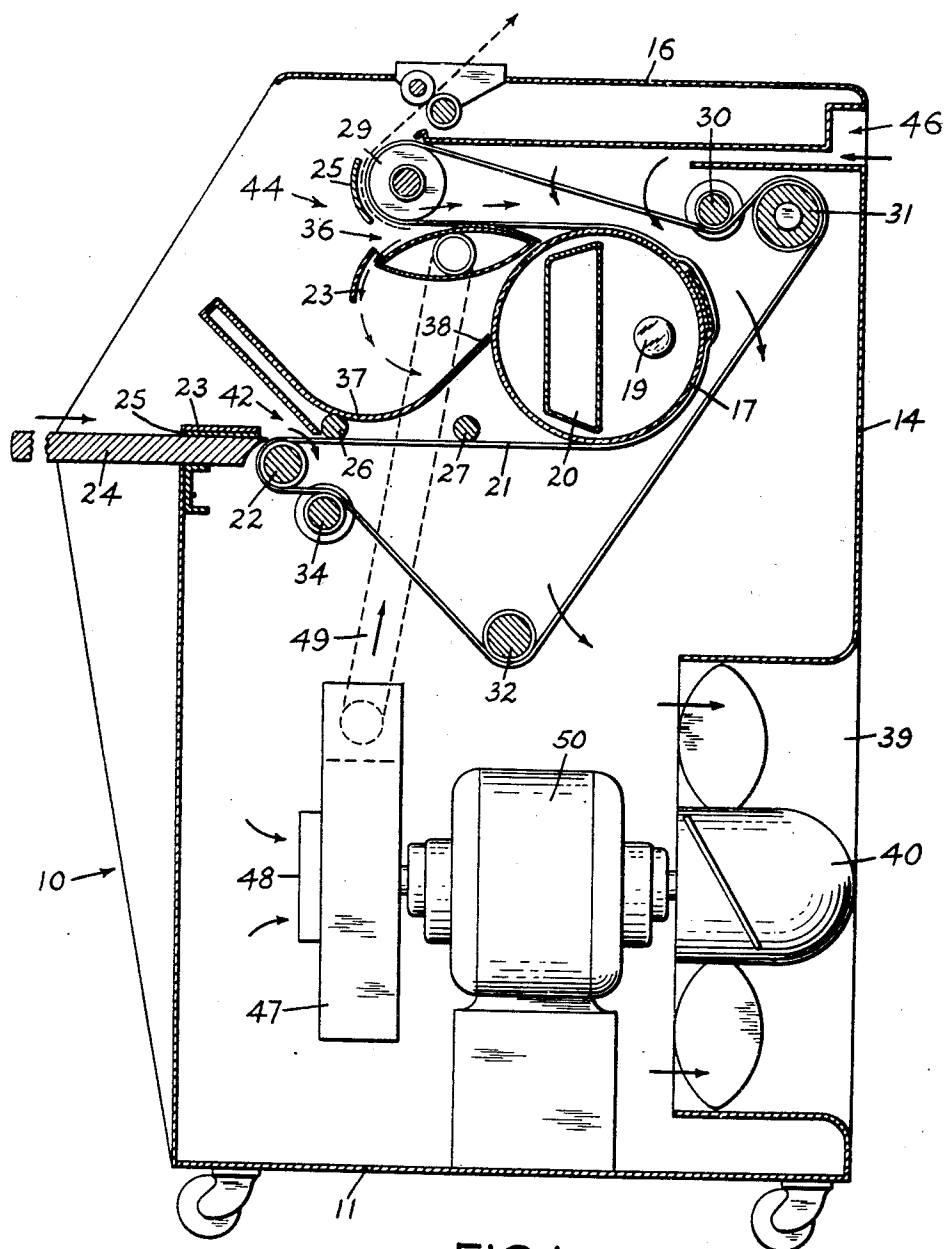


FIG. I.

INVENTOR.
PAUL B. STREICH

BY

Campbell, Brumbaugh & Eise

ATTORNEYS.

May 18, 1948.

P. B. STREICH

2,441,912

SHEET SEPARATING DEVICE

Filed July 23, 1946

2 Sheets-Sheet 2

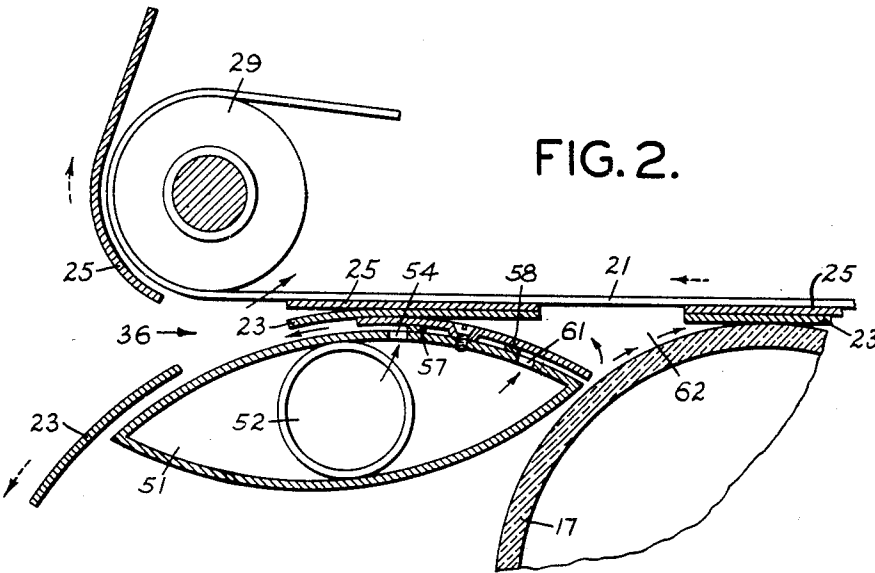


FIG. 2.

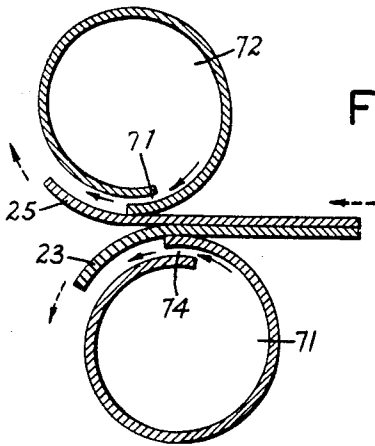


FIG. 3.

INVENTOR.
PAUL B. STREICH
BY
Campbell, Brumbaugh & Eise
ATTORNEYS.

Patented May 18, 1948

2,441,912

UNITED STATES PATENT OFFICE

2,441,912

SHEET SEPARATING DEVICE

Paul B. Streich, Maywood, Ill., assignor to Charles
Bruning Company, Inc., New York, N. Y., a
corporation of New York

Application July 23, 1946, Serial No. 685,636

12 Claims. (Cl. 271-74)

1

This invention relates to improvements in machines through which a pair of superimposed sheets of materials, such as paper, pass in face to face relation and wherein it is necessary or desirable that the sheets be automatically separated from one another at any given point or location in their passage through such machines. More particularly, it relates to a method of and apparatus for automatically separating tracings or the like from sensitized materials, such as sheets of sensitized paper after they have passed through a printing machine of the general type in which tracings and sensitized paper are fed around a light source in superimposed relation to one another.

In machines of this type, difficulty has been experienced in providing positive means of separating the tracings, of which prints are to be made, from the sensitized material. During the exposure to intense light, the tracings and the sensitized material are pressed together closely to eliminate relative motion between the two so as to insure sharp and exact reproductions of the tracings. The effect of this necessary pressure, possibly in combination with the effect of the heat transmitted by the light transmitting device, and their mutual attraction induced by static electricity generated by the passage of the tracing therearound, is to make difficult the separation of the tracings from the light transmitting device and from the sensitive material prior to the passage of the latter to a developing chamber.

Several attempts have been made to bring about automatic separation of tracings from sensitive material. As a general rule, these attempts have failed to completely remedy the situation because they were based on the theory that the application of suction or of subatmospheric pressure on one sheet would bring about the separation thereof from the other. When the sensitized material is fed through the machine in sizes approximately equal to those of the tracings, it frequently happens that the edges of the two sheets will not be in exact registry with one another so that when the two sheets pass over the suction device designed to separate them, both sheets will be attracted to the suction device sufficiently to frustrate attempts at automatic separation thereof.

An important object of the present invention is to provide a method and an apparatus to bring about automatic separation of tracings from sensitized material in a positive manner.

A further object of the invention is to provide a method and apparatus for positively separat-

2

ing tracings from sensitized material by the utilization of pneumatic pressure.

Another object of the invention is to provide sheet separating means capable of positively retaining tracings and sheets of sensitized material in their relative positions until they reach the point at which they are to be separated.

Another object is to provide a method and apparatus for stripping the tracing from the light transmitting device and to compel it to travel to the separating unit with the sensitized material.

Still another object of the invention is to provide a separating device that is easily adjustable so that the operator of the machine can with facility obtain access to the light-transmitting device for such purposes as that of cleaning its surface.

Other objects, features, and advantages of the present invention will appear upon consideration of the following detailed description and of the drawings, in which

Figure 1 is a view in transverse vertical section of a printing apparatus embodying one feature of the invention;

Figure 2 is an enlarged sectional view of one embodiment of the separating device of this invention; and

Figure 3 is a view similar to Figure 2 showing another embodiment of the present invention.

Referring to the drawings, the printing machine comprises apparatus within a casing 10, having a bottom 11, a front wall 12, a rear wall 14, and a top 16. Mounted transversely of the casing 10, and in the upper part thereof, is a light-transmitting cylinder 17 of heat resisting material, such as "Pyrex." This cylinder 17 is usually mounted for rotation but may be fixedly mounted. If fixed, the light-transmitting device may be non-cylindrical and have a flat or convex light transmitting surface. A suitable lamp 19, such as a mercury vapor lamp, is mounted within the cylinder 17 in any suitable position, and the cylinder 17 may further be provided with a duct 20 suitable for introducing cooling air into cylinder 17 and/or acting as a light shield for part of the cylinder. This duct 20 or light shield may furthermore be provided with a reflecting surface to increase the intensity of the light transmitted through the non-shielded portion of cylinder 17.

A series of flexible endless bands 21 pass around the light transmitting portion of cylinder 17, or if a non-cylindrical light transmitting device is used, pass over the flat or convex light transmitting portion of the light transmitting device. In

3

the printing machine illustrated in Figure 1, bands 21 pass rearwardly over the roller 22 to the lower portion of the periphery of cylinder 17, thus providing a travelling platform to receive the tracings 23 and sensitized paper 25 from a feed board 24. A series of auxiliary rollers 26 and 27, or any other suitable means, may be used to inhibit relative movement between the sensitized paper 25 and the tracings 23 in superimposed relation to one another after they leave feed board 24. From the bottom of the periphery of cylinder 17, the tracings and the light sensitive material pass around the light transmitting portion of cylinder 17 while being held in contact therewith by means of endless bands 21. At the top of the periphery of cylinder 17, the endless bands 21 move forwardly and substantially horizontally to the bottom of a roller 29, upwardly at its front and rearwardly to rollers 30 and 31, at the rear part of the casing 10. At the rear of roller 31, bands 21 pass downwardly and forwardly to a roller 32 and thence upwardly and forwardly to roller 22 by way of a roller 34.

The tracings and the sensitized material leave cylinder 17 at substantially the same point as the endless bands 21 and move forwardly thereunder over the separating device, indicated generally by reference numeral 36, to be described more particularly hereinafter, whereupon the tracings are separated from the sensitized material so that the tracings are deposited in a tray 37 which may, if desired, be provided with a stripper edge 38, and the sensitized material is carried upwardly over roller 29 out of the top 16 of the printing machine so that it may be developed.

The printing machine is ventilated and maintained under subatmospheric pressure by providing an exhaust outlet 39 in the rear wall 14 of the casing and an exhaust fan 40 to force air outwardly through said outlet, thereby drawing in cool air through the openings 42, 44 and 46 provided in the casing, as well as through any other openings, such as for the ventilation of cylinder 17, not shown in the drawings. Aside from the cooling and ventilating accomplished by this means, for the purpose of the present invention it is sufficient to note that exhaust fan 40 maintains a subatmospheric pressure behind roller 29 and above endless bands 21 as they pass from the top of cylinder 17 to the bottom of roller 29.

The printing machine is also provided with a blower 47 which may take in air either directly from the outside or, as shown in Figure 1, through opening 48 from the interior of the machine to supply air at superatmospheric pressure to separating device 36 by means of a conduit 49.

Exhaust fan 40 and blower 47 may be driven individually by any suitable means or together, as shown in Figure 1, by any suitable means, such as by electric motor 50.

Instead of providing the casing 10 with an exhaust outlet 39 and an exhaust fan 40, it is also within the contemplation of this invention to cool and ventilate casing 10, and to maintain the interior thereof under subatmospheric pressure entirely by exhausting air therefrom through opening 48 of blower 47 and supplying said air under superatmospheric pressure to the separating device by way of duct 49.

Referring now more particularly to Figure 2 of the drawing, a separating device 36 is shown in detail both as to its construction and as to its position relative to cylinder 17, roller 29 and

4

bands 21 moving from the top of cylinder 17 to the bottom of roller 29.

The separating device 36, as shown in this modification, comprises a pressure chamber 51 having a lenticular cross section the upper surface of which is convexly curved in the direction of movement of tracings 23 and sensitized materials 25. It is provided at one or both ends with an opening 52 which is connected to the blower 47 by means of duct or ducts 49. At a locus of points at which the upper surface of pressure chamber 51 is substantially tangential with relation to endless bands 21, pressure chamber 51 is provided with a series of perforations or orifices 54. A cover plate 56 is spaced from the exterior surface of pressure chamber 51, by means of spacers 57 and 58, and is attached to pressure chamber 51 by any suitable means such as screws or bolts. The air forced through orifices 54 by the pressure in chamber 51 enters the port between the curved surface of the separator and the cover plate 56 and is emitted from this port at a high velocity in a direction tangential to the curved surface. As tracing 23 passes over the portion of the curved surface forward of the port, the space between the tracing and the curved surface forms an air passage of increasing area relative to the distance forward of the port. The air passing through this passage at a high velocity must, because of this increase in area, either undergo a reduction in velocity to fill this space or rarefy as the area increases. In either event a reaction is set up which reduces the air pressure in this passage to subatmospheric pressure. It is this subatmospheric pressure that forces the tracing toward the curved surface of the separator and away from the sheet of sensitized material until the pressure on both sides of the tracing is substantially equalized. The sensitized material 25, which is adjacent endless bands 21, remains attracted to said bands by reason of the subatmospheric pressure behind roller 29 maintained by exhaust fan 40, whereas the tracings 23, which are adjacent the sensitized material, are attracted away from the sensitized material by reason of the jet or air expressed through orifices 54 and the accompanying reduction in pressure in the space between bands 21 and pressure chamber 51 as explained above. As a result, the sensitized material will cling to bands 21 and pass upwardly and around roller 29, whereas the tracings will be separated therefrom and passed downwardly into tray 37.

It is to be understood that this invention is not limited to the specific construction shown in the drawing. Thus, for example, the upper surface of the pressure chamber may be provided with a ridge having a series of orifices capable of directing streams of air in substantially the plane of the paper, thereby eliminating the necessity for a spaced plate such as cover plate 56.

If it is deemed desirable, the pressure of air in pressure chamber 51 may also be utilized to strip the tracing from cylinder 17 and to positively retain the superimposed positions of the sensitized material and the tracings relative to endless bands 21 after they leave cylinder 17 and until they come in contact with spaced plate 56. This is accomplished by providing the pressure chamber 51 with another series of orifices 61 in the rear portion of the said pressure chamber and, if desired, extending cover plate 56 rearwardly and over orifices 61 to deflect the air

5

issuing from orifices 61 so that it will pass close to the surface of cylinder 17 and upwardly into space 62 bounded by cylinder 17, spaced plate 56 and endless bands 21. This modification will provide superatmospheric pressure in space 62 so that the tracing will be stripped from the cylinder and the sensitized material and the tracings will remain adjacent endless bands 21 until they are ready to be separated.

If desired, the separating device of this invention may be mounted so that its position can easily be changed to allow the operator to clean the surface of cylinder 17 or to make adjustments within space 62, should such action become necessary. For this purpose, the ends of pressure chamber 51 may be mounted pivotally to the end walls of casing 10. When pressure chamber 51 is so mounted, the connection of duct 49 to hole 52 is suitably made flexible or, since the device is not required to operate when access to space 62 is sought, duct 49 may simply be disconnected from the end of pressure chamber 51.

Another modification of the present invention, applicable particularly when the sheets of tracings and sensitized material are of sufficient stiffness to follow a straight line for a short distance such as about four inches, is shown diagrammatically in Figure 3. In this instance, the tracing 23 may be separated from the sensitized material 25 after both have been removed from endless bands 21 and guided, by any suitable means, to the separating device, consisting essentially of pressure chambers 71 and 72, preferably placed in staggered positions as shown in the drawing. The lower sheet is removed positively from the upper sheet by air flowing through a restricted opening 74, whereas the upper sheet is likewise separated positively from the lower sheet by air flowing through a restricted opening 77, the principle by means of which said sheets are forcibly deflected from their normal paths being the same as that described in the discussion of the modification illustrated in Figure 2. Any suitable means for guiding the sheets after they have been separated may be installed proximate said pressure chambers to guide said sheets when they cease to be subject to the influence of the streams of air.

It is to be understood that various changes may be made and that various features may be used without others, without departing from the true scope and spirit of the present invention.

I claim:

1. A device for separating a pair of superimposed sheets in face to face relation, comprising means for advancing said sheets endwise in one direction, a member having a surface curved convexly in the direction of movement of said sheets for engaging the surface of one of said sheets, means for directing air under pressure in a direction substantially tangential to said curved surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said surface for separating said one of said sheets from the other, and means for directing said sheets away from said surface along different paths.

2. A device for separating a pair of superimposed sheets in face to face relation, comprising means for advancing said sheets endwise in one direction, a member having a cylindrical surface tangential to said advancing sheets for engaging the surface of one of said sheets, means for directing air under pressure in a direction sub-

6

stantially tangential to said cylindrical surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said surface for separating said one of said sheets from the other, and means for directing said sheets away from said surface along different paths.

3. A device for separating a pair of superimposed sheets in face to face relation comprising in combination a casing, an opening in said casing, means for advancing said sheets endwise in one direction through said casing to said opening, a member mounted proximate said opening having a surface curved convexly in the direction of movement of said sheets for engaging the surface of one of said sheets, means for directing air under pressure in a direction substantially tangential to said curved surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said surface for separating said one of said sheets from the other, and means for directing said sheets away from said surface along different paths.

4. A device for separating a pair of superimposed sheets in face to face relation, comprising a casing, an opening in said casing for feeding into the casing in superimposed, face to face relation a sheet of sensitized material and a tracing, a second opening in said casing for discharging said sensitized material and tracing, band means for advancing said sensitized material and tracing endwise through said casing from the first named opening to said second opening, a member proximate said second opening having a surface curved convexly in the direction of movement of said sensitized material and tracing for engaging the surface of the tracing, means for directing air under pressure in a direction substantially tangential to said curved surface and in the direction of movement of said sensitized material and tracing to create a zone of reduced pressure adjacent to said surface for separating the tracing from the sensitized material, and means for directing said tracing and sensitized material away from said surface along different paths.

5. In a printing machine of the character described, the combination of a light transmitting device, a source of light within said light-transmitting device, a casing to enclose said light-transmitting device and source of light, means for maintaining the interior of said casing under subatmospheric pressure, an opening in said casing for feeding into the casing in superimposed, face to face relation a sheet of sensitized material and a tracing, a second opening in said casing for discharging said sensitized material and tracing, band means for advancing said sensitized material and tracing endwise through said casing from the first named opening to said second opening, a member proximate said second opening having a surface curved convexly in the direction of movement of said sensitized material and tracing for engaging the surface of the tracing, means for directing air under pressure in a direction substantially tangential to said curved surface and in the direction of movement of said sensitized material and tracing to create a zone of reduced pressure adjacent to said surface for separating the tracing from the sensitized material, and means for directing said tracing and sensitized material away from said surface along different paths, said sensitized material being held in contact with said band means by the subatmospheric pressure maintained

7

within the casing during the separation thereof from the tracing.

6. A device for separating a pair of superimposed sheets in face to face relation, comprising a series of flexible bands for advancing on the under surface thereof said sheets endwise in one direction, a member having a surface curved convexly in the direction of movement of said sheets for engaging the surface of one of said sheets, means for directing air under pressure against said sheets to maintain them against the under surface of said flexible bands until the surface of the lower sheet comes into contact with the member having a convexly curved surface, second means for directing air under pressure in a direction substantially tangential to said curved surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said surface for separating said one of said sheets from the other, and means for directing said sheets away from said surface along different paths.

7. A device for separating a pair of superimposed sheets in face to face relation, comprising means for advancing said sheets endwise in one direction, a pressure chamber having a surface curved convexly in the direction of movement of said sheets for engaging the surface of one of said sheets, means for directing air under pressure in a direction substantially tangential to said curved surface and in the direction of movement in said sheets to create a zone of reduced pressure adjacent to said surface for separating said one of said sheets from the other, and means for directing said sheets away from said surface along different paths.

8. A method of separating a pair of superimposed sheets in face to face relation, which comprises advancing said sheets endwise in one direction over a surface curved convexly in the direction of movement of said sheets, directing air under pressure in a direction substantially tangential to said curved surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said surface for separating one of said sheets from the other, and directing said sheets away from said surface along different paths.

9. A device for separating a pair of superimposed sheets in face to face relation, comprising means for advancing said sheets endwise in one direction, a member having a surface curved convexly in the direction of movement of said sheets for engaging the surface of one of said sheets, means for directing air under pressure in a direction substantially tangential to said curved surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said surface for separating said one of said sheets from the other, a second member having a surface curved convexly in the direction of movement of said sheets for engaging the surface of the other of said sheets, means for directing air under pressure substantially tangential to said second curved surface in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said surface of the other of said sheets, and means for directing said sheets away from said surfaces along different paths.

8

10. A device for separating a pair of superimposed sheets in face to face relation as defined in claim 9, wherein the second member having a convexly curved surface is positioned behind the first member having a convexly curved surface relative to the direction of movement of the sheets.

11. A device for separating a pair of superimposed sheets in face to face relation, comprising means for advancing said sheets endwise in one direction, a member having substantially a cylindrical surface tangential to said advancing sheets for engaging the surface of one of said sheets, means for directing air under pressure in a direction substantially tangential to said cylindrical surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said surface for separating said one of said sheets from the other, a second member having substantially a cylindrical surface tangential to said advancing sheets for engaging the surface of the other of said sheets, means for directing air under pressure in a direction substantially tangential to said second cylindrical surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said surface of the other of said sheets, and means for directing said sheets away from said surfaces along different paths.

12. A device for separating a pair of superimposed sheets in face to face relation comprising means for advancing said sheets endwise in one direction, a member having substantially a cylindrical surface tangential to the lower surface of the lower of said sheets, means for directing air under pressure in a direction substantially tangential to said cylindrical surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said lower surface for deflecting the path of said lower sheet along the cylindrical surface of said member, a second member in staggered relation to said first member relative to the direction of movement of said sheets, said second member having substantially a cylindrical surface tangential to said advancing sheets for engaging the upper surface of the upper of said sheets, and means for directing air under pressure in a direction substantially tangential to said second cylindrical surface and in the direction of movement of said sheets to create a zone of reduced pressure adjacent to said upper surface for deflecting the path of said upper sheet along the cylindrical surface of said second member.

PAUL B. STREICH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,827,753	Kinney	Oct. 20, 1931
1,968,941	Hall et al.	Aug. 7, 1934
1,980,188	Cullen et al.	Nov. 13, 1934
2,261,971	Matthews	Nov. 11, 1941
2,292,521	Horn	Aug. 11, 1942
2,352,983	Trump	July 4, 1944

Certificate of Correction

Patent No. 2,441,912.

May 18, 1948.

PAUL B. STREICH

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 4, line 47, for the word "or" before "air" read *of*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of July, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.

Certificate of Correction

Patent No. 2,441,912.

May 18, 1948.

PAUL B. STREICH

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 4, line 47, for the word "or" before "air" read *of*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of July, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.