

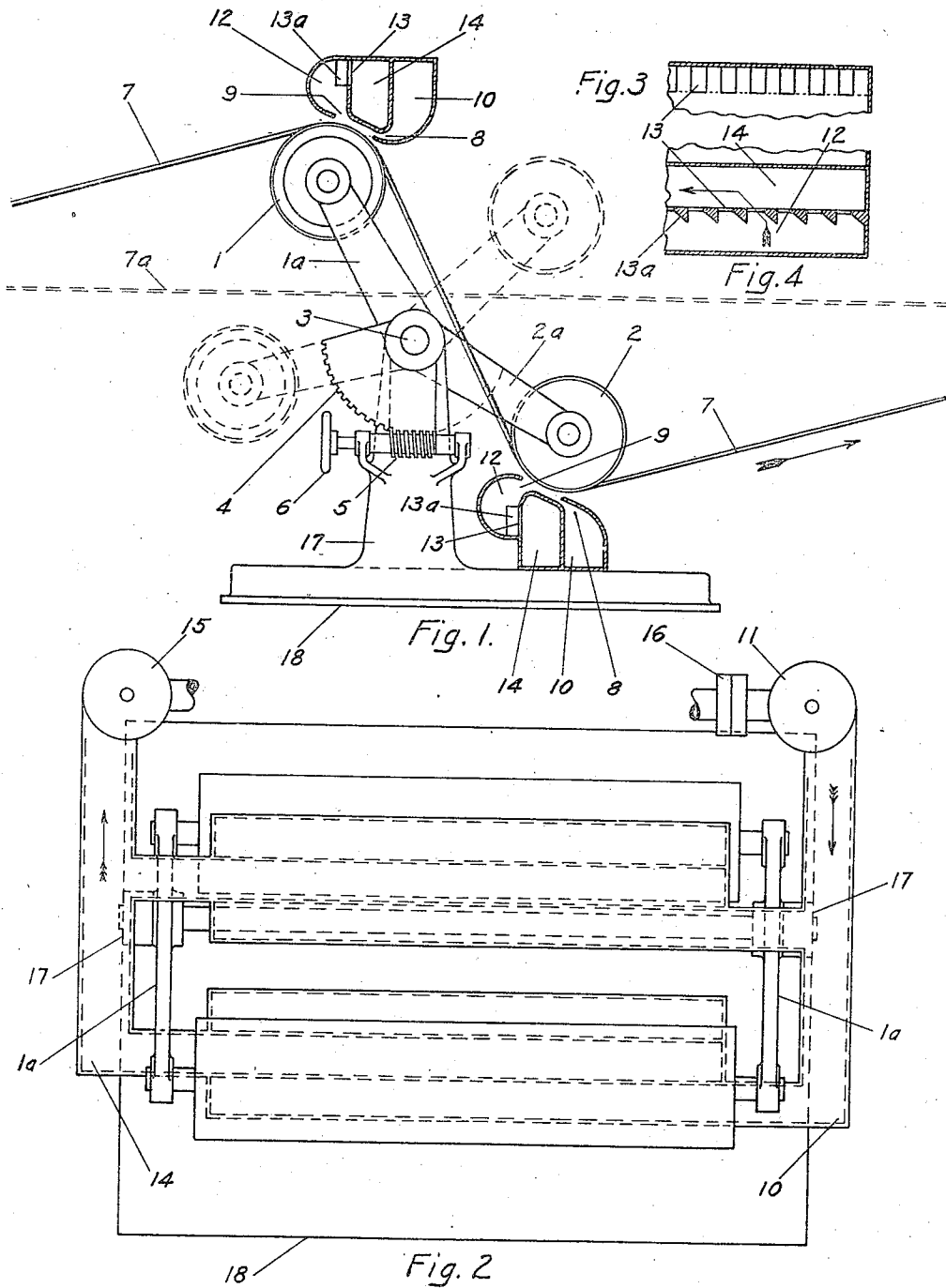
June 1, 1937.

C. J. MERRILL

2,082,411

PAPER CLEANING DEVICE

Filed Aug. 20, 1935



Carle J. Merrill
INVENTOR

By *Rindow & Rindow*

UNITED STATES PATENT OFFICE

2,082,411

PAPER CLEANING DEVICE

Carle J. Merrill, Portland, Maine

Application August 20, 1935, Serial No. 37,086

5 Claims. (Cl. 15-14)

This invention relates to a machine and method for removing particles of dirt or other foreign material from the surface of a finished web of paper or other similar material. It is primarily designed for cleaning a web of coated paper and while it will be discussed in this connection this is not to be held as limiting but rather as a specific example of application.

Highly finished paper, particularly that which has had applied to its surface a coating material collects dirt and other foreign material on its surface requiring that this be removed before it has become embedded in the surface of the sheet or in the coating material or otherwise mar or injure the finished surface.

The use of highly finished papers such as are used for the printing of intricate cuts, frequently in color, requires that the type be kept perfectly clean and any surface dirt or other foreign material on the paper fouls the type, electroplate, and other ink covered surfaces greatly injuring the quality of the printing and necessitating frequent cleaning of the printing equipment.

It is the purpose of the present device to remove this surface dirt before it has marred or injured the sheet and to eliminate smudgy or defective printing by this dirt adhering to the type or other printing surfaces; and also to provide a device which is simple and which will not interfere with other operations or the handling of the web of coated paper.

I am aware that a cleaning apparatus has been devised particularly for the cleaning of rugs and carpets where both air jets and suction have been employed. I am also aware that air and suction combined with other means have been used for the cleaning of metal plates and other similar materials. None of these devices, however, used either individually or in combination would suffice for the cleaning of a sheet of coated paper or in any way perform the functions herein described. Any rubbing action or contact with a sheet of highly finished paper either in the form of moving it across the cleaning nozzles or past brushes or scrapers would not only be entirely inadequate as a cleaning means, but would injure the sheet to a very great degree.

Other means have been disclosed for removing dirt from paper by means of brushes, scrapers or wipers but these methods have the disadvantage of contributing to sheet injury by the rubbing action of the removing mechanism itself. I employ no such methods in my device and remove the surface dirt by properly controlled and directed air jets and passages, combined with

the mechanism for bringing and maintaining the sheet in proper relation and position relative to these jets and passages.

As illustrative of this machine and method reference is made to the following drawing—

Fig. 1 is an end view of the machine with the air cleaning passages shown in section. The full line shows the sheet or web in cleaning position.

The dotted line shows the position of the parts of the machine and of the web when it is inserted into the machine.

Fig. 2 is a plan view of the machine.

Fig. 3 is a side view of the air suction deflectors.

Fig. 4 is a sectional view through the air suction deflectors.

In Fig. 1 the rolls 1 and 2 are shown guiding and holding the paper in cleaning position relative to the air jets and passages, the paper web being shown at 7.

The dotted lines on Fig. 1 show these guiding rolls in the position for inserting the web into the machine, the web in this instance being designated at 7a. It will be seen that ample space is provided for the insertion of the web and that it is unnecessary to pass it through restricted openings which would consume time and subject the sheet to possible injury.

The movement of the guide rolls 1 and 2 about the pivot 3 also permits their being brought into close proximity and position relative to the air cleaning passages, not only permitting that the rolls be adjusted accurately to the closest and most efficient cleaning position but also insuring that they be maintained in this position throughout operation.

The rolls 1 and 2 are mounted in suitable bearings mounted in arms 1a and 2a which are fixed to a common hub and rotate about a pivot shaft 3. This pivot shaft 3 is mounted in a suitable stand or support 17 carried by a base 18. The base 18 extends the entire width of the machine, there being two supporting stands 17, one at each end.

The rotation of these arms and rolls about the pivot point 3 is accomplished by any suitable means. As illustrative of a means for accomplishing this result I show a gear segment 4 meshing with a worm 5 which is operated by a hand wheel 6. In threading position the arms and rolls are moved counter-clockwise into the position shown by the dotted lines. In this position the paper web can be passed straight through the cleaning device as illustrated by the horizontal dotted line 7a. After the web has passed through the device the arms 1a and 2a carrying

the rolls 1 and 2 are rotated in a clockwise direction bringing them into the position shown in Fig. 1 and the paper web 7 in close proximity to the cleaning nozzles.

5 The cleaning nozzles consist of an air jet nozzle 8 and a vacuum or suction nozzle 9. Air is supplied to nozzle 8 by means of a duct 10 and a fan, or other suitable device 11. Air pressure being maintained in passage 10 passes through the restricted nozzle or opening 8 at high speed and impinges directly on the surface of sheet 7 passing over roll 1 in a direction opposite to the air motion.

This air passing over the sheet at high speed and through a restricted and accurately proportioned passage removes any dirt or other foreign matter which may be present on the surface of the sheet and this air and dirt is drawn through nozzle 9 into a passage 12 thence passing by deflector vanes 13a into a suction duct 14. This suction can be produced by any suitable means such as fan 15.

It is highly important that the nozzles 8 and 9 be correctly proportioned and that the traveling paper sheet or web 7 be maintained in close proximity to the outside edge of these nozzles but under no condition must the nozzles touch the sheet, otherwise the sheet would be injured. It is particularly important that a minimum space be provided between the edge of nozzle 9 and the traveling web in order to insure that the dirt which has been loosened by the air in nozzle 8 be thoroughly removed or lifted away from the sheet and immediately carried away through the passage 12 and the suction duct 14.

It is particularly important that this lifting action of the nozzle 9 on the dirt be uniform over the entire width of the sheet. To insure this I provide a properly proportioned and curved passage 12 which insures a smooth and uniform flow of air through the entire length of the nozzle 9 as urged through the nozzle by the suction in duct 14. In order that the air suction in duct 14 be uniform in the passage 12 and nozzle 9 I provide a plurality of openings 13 and deflectors 13a, these deflectors and openings are shown more clearly in Figs. 3 and 4.

As the air and dirt enter the nozzle 9 it continues its motion in substantially the same direction passing around the curved wall of space 12 until it encounters the deflectors 13a. It is then deflected in the direction of the arrow shown in Fig. 4 and enters the duct 14 being drawn away by the fan or other suitable device 15.

55 If necessary or desirable the roll 1 can be provided with a soft or yielding surface which will not tend to embed or firmly lodge any dirt which may be present on the underside of sheet 7 and before it has been cleaned by the air passages adjacent the roll 2. Such a surface is not necessary on roll 2 as the surface of sheet 7 in contact with this roll has already been cleaned.

Where it may be necessary that the air used to remove the dirt or other foreign matter from the sheet be in itself clean and free from dirt an air cleaner 16 can be used adjacent to fan 11 either on the suction side as shown or at any other suitable point. Similarly if there is sufficient dirt taken from the sheet and discharged by fan 15 an air cleaner can be installed to remove this dirt from the air before it is discharged into the room or elsewhere.

Referring to Fig. 2 which is a plan view of the apparatus, it will be noted that I have shown two fans, one for purposes of furnishing air pressure

and the other for purposes of furnishing air suction. The fan 11 as I have shown it is the pressure fan and fan 15 is the suction fan each being connected by suitable air ducts to passages 10 and 14 respectively.

It is, however, possible to use a single fan connecting the discharge sides of the fan to the air passage 10 and the suction side of the fan, passage 14. In this case there would be a suitable opening in the discharge side of the fan through which a portion of the air would be discharged outside of the machine. The air passing through this opening would carry off a certain amount of the dirt which might be contained in the air and this air would be replaced by the small leakage around the suction nozzle 9 between it and the moving web of paper.

In case it seems desirable to use a single fan and where it is necessary or desirable that the air itself be free from dirt prior to being impinged on the sheet, an air cleaner may be placed between the single fan and the air duct 10 which would remove all dirt from the air being blown over the web of paper not only that which might be contained in the air itself but also that which was recirculated by the fan taking its air from suction duct 14. A small quantity of air would be discharged from the pressure side of the fan to insure that adequate suction was present over the entire length and area of the suction nozzle 9.

The use of fans for air pressure and air suction is merely illustrative as well as their general arrangement in connection with my machine and must be interpreted as simply illustrative of one method by which I may obtain a supply of air for my purpose.

Similarly, while I have shown a particular type of mechanism as applied to the cleaning of a web of coated paper this is simply illustrative of my method and I do not limit myself thereby to any specific method or arrangement of equipment.

What I therefore claim and desire to secure by Letters Patent is:—

1. In a machine for surface cleaning, the combination of a roll around which the material to be cleaned is passed, an air pressure nozzle, an air suction nozzle arranged in proximity to the air pressure nozzle so as to carry off air blown therefrom, and means to move said roll and the material thereon into proximity to but out of contact with said nozzles and to hold the same in said position.

2. In a machine for cleaning the surface of a travelling web of paper, the combination with air pressure and air suction cleaning mechanism arranged so as to operate on both sides of said web, of two rolls for guiding the continuously moving web of paper, means for maintaining these rolls in a fixed position relative to each other and means to move both rolls and the moving web of paper into proximity to but out of contact with the air pressure and air suction cleaning mechanism, whereby both sides of the paper web may be cleaned.

3. In a cleaning machine, the combination of a roll having a relatively soft surface, an air pressure nozzle, an air suction nozzle, a second roll having a relatively hard surface, a second air pressure nozzle and an air suction nozzle, each of said air suction nozzles being arranged in direct proximity to its respective air pressure nozzle so as to carry off air blown therefrom, a structure in which both rolls are mounted, a pivoted shaft located between the rolls and about which the

roll mounting structure may be moved, and means to move the first mentioned roll to and from the first mentioned air pressure and suction nozzle, and the second roll to and from the other air pressure and suction nozzle.

4. The combination of a roll suitable for guiding a moving web of paper, an air pressure nozzle, an air suction nozzle arranged in proximity to the air pressure nozzle so as to carry off air blown therefrom, said nozzles each covering the entire width of paper passing over said roll, an air suction passage, a plurality of openings formed in a wall of said air suction nozzle and a plurality of deflectors on an interior wall of said air suction nozzle adjacent said openings between said air suction passage and said air suction nozzle for effecting a substantially uniform suction over the entire width of the web, and also to

change the direction of dust particles into said air suction nozzle.

5. In a cleaning machine the combination of two rolls over which a moving web of paper is passed, one side of said web being in contact with one roll and the other side of said web being in contact with the other roll, an air pressure and suction cleaning mechanism arranged to operate on both sides of the paper web, the suction cleaning mechanism being arranged in proximity to the air pressure mechanism to carry off air blown thereby, and means to move each of said rolls and the material thereon into proximity to but out of contact with said air pressure and air suction cleaning mechanism whereby both sides of the moving web are cleaned.

CARLE J. MERRILL.