Sept. 24, 1935. A. BARTSCH 2,015,583

CLEANING MACHINE

Filed April 23, 1935 3 Sheets-Sheet 1

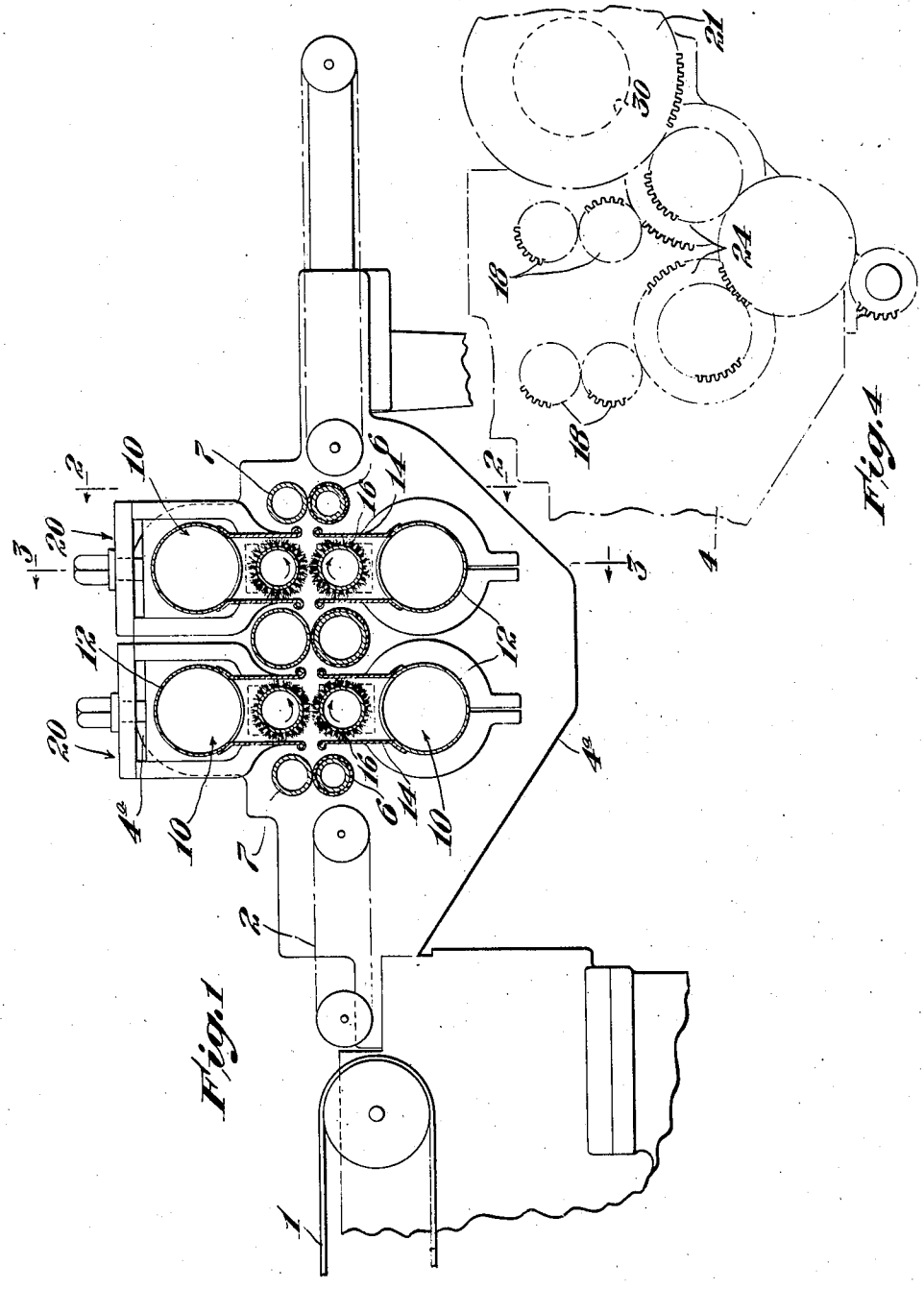


Fig. 1

Fig. 4

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Filed April 23, 1935 3 Sheets-Sheet 2

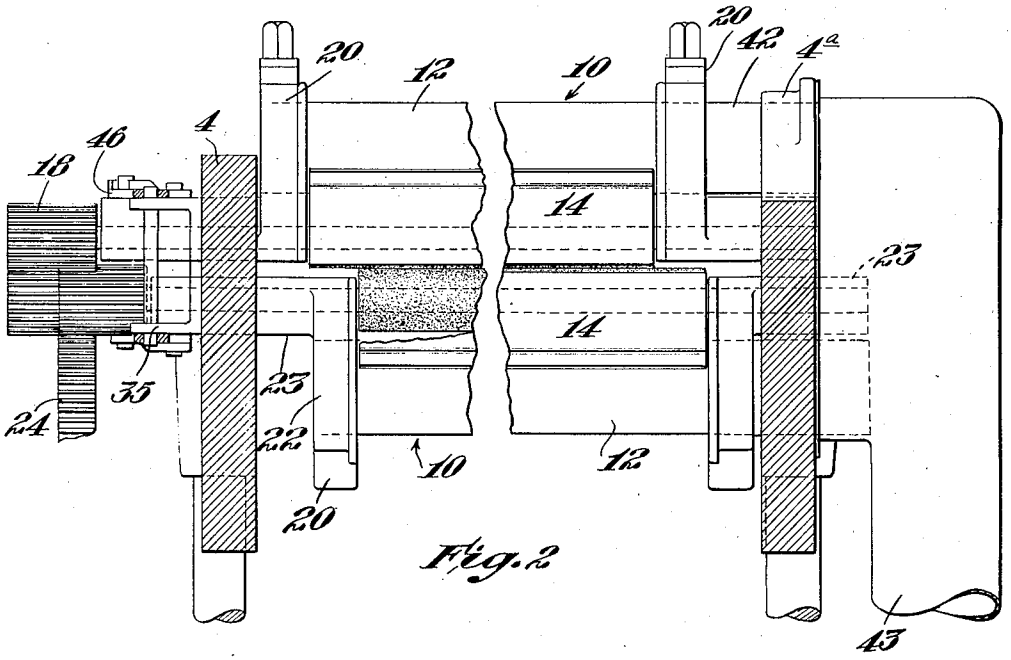


Fig. 2

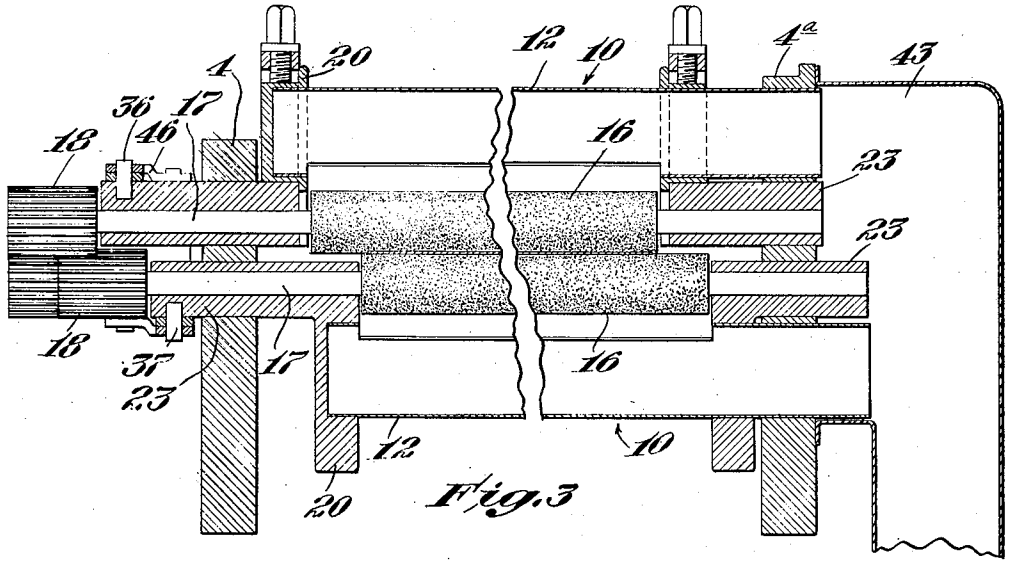


Fig. 3

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Filed April 23, 1935 3 Sheets-Sheet 3

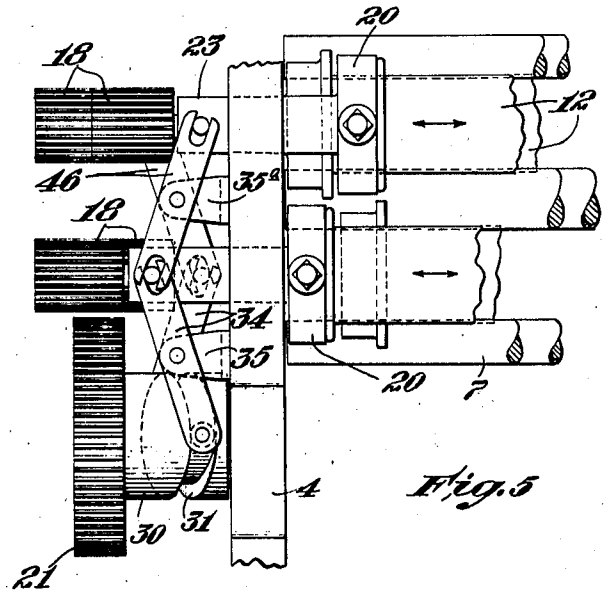


Fig. 5

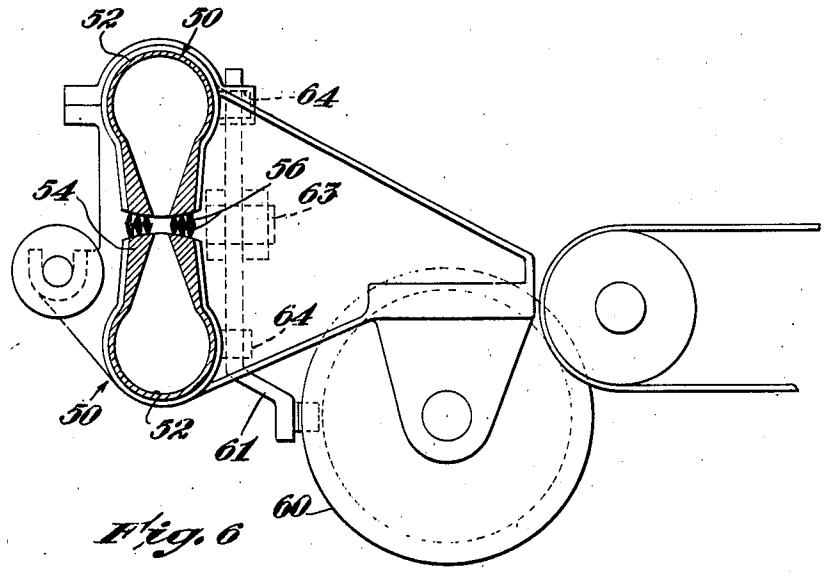


Fig. 6

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UNITED STATES PATENT OFFICE

2,015,583

CLEANING MACHINE

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Application April 23, 1935, Serial No. 17,779
In Germany October 24, 1932

4 Claims. (Cl. 15—7)

This invention relates to an improved cleaning method and machine, particularly for removing powder or fine particles from sheet material. A machine of this character is especially suitable for removing small particles from sheet articles which have been treated by decorative processes, such as bronzing, dusting with powder or the like.

When paper sheets are treated in this manner, metallic powder or the like is applied to the areas to be decorated and these areas are then burnished. During this treatment some of the powder is likely to be scattered outside of the burnished area. The neatness and attractive appearance of such decorated sheets largely depends upon the clearness and freedom from powder of the undecorated regions and the consequent contrast between the appearance of the decorated and undecorated areas. Accordingly it is highly desirable to remove superfluous powder or the like from the portion of the sheet article which has not been bronzed or decorated. Often this powder not only remains upon areas of the article adjoining the decorated portion, but particularly when a plurality of sheets are being treated and cleaned in succession, particles may be deposited upon edges of the sheets and upon the under surfaces thereof.

It is the purpose of the present invention to afford a machine and method for effectively cleaning sheet articles to remove all superfluous powder of this character not only from the areas adjoining the decorated portions, but also from the edges of the sheets and the lower surfaces thereof.

To permit these desirable results the present invention affords means to advance successive sheet articles between cleaning elements, each of which may comprise a suction nozzle and/or a brush or brushes. Preferably these elements are arranged in successive pairs, the elements of each pair being located in opposed relation respectively above and below the path of the sheet articles so that both faces thereof are cleaned. Each of the nozzle and/or brush elements may be movable transversely in relation to the path of movement of the sheet articles. Thus relative movement between the cleaning elements and the articles occurs in both a transverse and longitudinal direction. Accordingly an unusually effective cleaning action is provided upon the edges as well as the faces of the articles.

A further feature of the invention relates to the arrangement of the brushes so that their bristles may constantly be subjected to the cleaning effect of air being drawn into the suction nozzles. Such an arrangement avoids certain deficiencies of earlier cleaning devices in which cleaning brushes might become filled with the powder so that the brushes themselves were liable to redeposit the powder on parts of the sheet articles.

In the accompanying drawings:

Fig. 1 is a side elevation of a portion of the machine constructed in accordance with this invention, a part of the framing of the machine being removed and parts being shown in section, while certain auxiliary portions of the machine are diagrammatically indicated;

Figs. 2 and 3 are transverse sections indicated by line 2—2 and 3—3 respectively of Fig. 1;

Fig. 4 is an elevational view, somewhat diagrammatic in character, showing the arrangement of driving elements for the machine;

Fig. 5 is a plan view of a portion of the machine illustrated in Fig. 1; and

Fig. 6 is a vertical section through a portion of a similar machine employing an optional type of cleaning elements.

Any suitable conveyor, such as the belt 1 shown in the accompanying drawings may supply sheet material to the machine. Such material may be sheets of paper which have just been subjected to a decorative treatment, as for example decoration by metallic powder, e. g., bronzing or the like. Sheet articles may be delivered from the conveyor 1 to a small belt 2 which is supported between the side frame portions 4 and 4a of the cleaning machine.

A plurality of lower conveyor rolls 6 are disposed at spaced intervals between the frame portions 4 and 4a of the machine, the rolls 6 being covered with material having a reasonably high coefficient of friction, such as a woven fabric. Any suitable driving means (not shown) may be arranged to rotate the rolls 6. Rolls 7 may be arranged above the lower rolls 6 and in closely spaced relation thereto, the rolls 7 preferably being formed of metal and being free from covering material.

Pairs of cleaning elements, designated in general by numeral 10, may be arranged between adjoining pairs of conveyor rolls. Each of the elements 10 may include a transverse duct or suction chamber 12 which communicates with a nozzle portion 14 that has an open slot-like mouth portion in closely spaced relation to the horizontal path of the sheet articles that is determined by the bites of the pairs of conveyor rolls 6—7. The ends of the duct portions 12 of the cleaning elements 10 extend into a suction

chamber 43, which is connected to any suitable means for creating a partial vacuum, Fig. 3.

Disposed within the mouth of each nozzle portion 14, I preferably provide a rotary brush 16. Each brush may be arranged so that the ends of its bristles are juxtaposed to the side walls of the nozzle portion 14; thus air which is drawn by suction into the nozzle must flow between the solid body portion of the brush and the walls of the nozzle. Accordingly an air draft of considerable intensity passes over the bristles in these regions, tending effectively to remove any powder or discrete material which has caught upon the bristles and which otherwise might be redeposited upon a subsequent portion of the sheet material.

Referring to Fig. 3, it is evident that each of the rotary brushes 16 is provided with a shaft 17 extending through the side frame of the machine and carrying a gear 18. The gears 18 of the upper and lower rolls of each pair mesh with each other and the lower gear of each pair may be driven by a driving gear 24 as shown in Fig. 4.

Preferably the cleaning elements 10 are arranged to reciprocate along paths transverse to the path of sheet article movement. For this purpose sub-frames 20 may be provided for the ends of the respective cleaning elements, each of these sub-frames having outwardly extending extensions 23 into which shafts 17 extend, and which are slidable in openings in the side frames 4 and 4a.

In order to cause the opposite reciprocatory movement of the upper and lower side frames and of the cleaning elements, driving mechanism of the character particularly illustrated in Fig. 5 may be provided. Thus the cam roller 30, which may be driven by a gear 21 (Fig. 4), may provide a cam groove 31 engaging a pair of similar roller followers, one of which is indicated by dotted lines in Fig. 5. Each of the followers is rotatably secured to the end of a rocking arm 34, the midportion of which is pivotally connected to a fixed bracket 35. The forked ends of the brackets 34 engage upper and lower pins 36 and 37 (Figs. 2 and 3) respectively upon the upper and lower bosses 23 of the adjoining subframes. Between these bosses and the bosses of the succeeding pair of cleaning elements is a bracket 35a similar to the bracket 35. Rocking arms 46 have their midportions pivotally connected to this bracket and have forked ends engageable with the pins 36 and 37, the opposite ends of these arms having similar connections with the bosses 23 projecting from the next pair of sub-frames.

In the operation of a machine of the character described, sheet material is fed from the belt 1 to the belt 2. This sheet material, for example, may be in the form of successive sheets which have just been subjected to treatment with decorative powder, as for example a bronzing and burnishing operation. Successive sheet articles pass from the belt 2 to the first pair of conveyor rolls 6—7, thence advancing between the first pair of cleaning elements 10. The brushes 16 of these elements rotate as indicated by the curved arrows of Fig. 1, in the same directions as the corresponding conveyor rolls. The loose dust upon the edges and faces of the sheet articles tends to be drawn into the suction nozzles 14 and tends to be loosened by the rotary brushes 16. The transverse movements of the brushes also tend to aid in loosening the material from attachment to the sheet articles.

In the illustrated embodiment of the invention, two pairs of upper and lower cleaning elements are shown, but it is obvious that a greater number of such elements may be employed if desired, or if preferred but a single pair of such elements may be used. The conveyor rolls 6—7 are disposed in such a relation to each other that they firmly hold the sheet material in proper position so that it moves in its own plane in a direction at right angles to the direction of reciprocatory movement of the cleaning elements. Obviously rotation of cam 30 causes the rocking arms 34 to swing back and forth, thus effecting reciprocatory movement of the upper and lower sub-frames 20.

During this movement the teeth of each pair of gears 18 will slide upon each other, for example, in the position illustrated in Figs. 2 and 3; the respective gears and cleaning elements 10 are at the opposite ends of their paths. It is evident that this arrangement permits the subjection of the faces of the sheet articles to a definite brushing action not only in the direction of article movement, but at right angles thereto, thus particularly aiding the cleaning of the edges of the articles. Furthermore the arrangement of the rotary brushes in the nozzles aids in the cleaning of the bristles of the brushes, since restricted air passages are provided at either side of the brushes and all parts of the brushes move through these passages where the air streams are concentrated.

Fig. 6 illustrates an optional form of cleaning element which may be arranged in a machine having the general organization of that illustrated in Figs. 1 to 4 inclusive. In this form of the invention, however, the cleaning elements 50 may be in the form of duct portions 52 connected to a suitable means for creating a partial vacuum, and nozzle-like extensions 54 somewhat similar to the extensions 14, but having substantial areas at either side of their slot-like mouths. Bristles 56 may be secured to these edge portions of the nozzles, thus in effect affording brush elements at each side of the nozzles. The ends of these bristles preferably are arranged in very close juxtaposition to each other so that as the sheet material passes between the cleaning elements it is subjected to a definite brushing action. The cleaning elements 50 may also be arranged to have a transverse reciprocatory movement, and for this purpose a cam roller 60 may drive a rocking lever 61 having its midportion pivotally mounted upon a fixed bracket, as designated by numeral 63, and having slotted end portions engaging studs 64 projecting from the upper and lower cleaning elements respectively.

With this form of the invention it is evident that the brush elements 56 are subjected to the draft of air which passes about the edges of the sides of the nozzles, i. e., between the same and sheet articles, so that the brush portions of these elements are subjected to the cleaning effect of the suction blast.

It is evident that the present invention affords a cleaning machine and method adapted effectively to remove material such as powder or discrete particles, from the faces and edges of sheet material, such as articles of paper which have been subjected to decorative treatment by bronzing or the like. This invention particularly assures the cleaning of both faces as well as the edges of the sheet articles, and provides arrangements particularly advantageous in permitting the brushes themselves to be subjected to the

effect of the suction blasts so that there is little liability of the brushes redepositing any of the discrete material upon a subsequent sheet article. Furthermore, the transverse reciprocatory movement of the cleaning elements assures a definite crosswise cleaning effect which is particularly advantageous in aiding the cleaning of the advance edges of the successive sheet articles.

I claim:

1. A machine of the class described comprising conveyor means to advance sheet material in its own plane, suction nozzles having mouths disposed adjoining the path of said material, said nozzles being arranged upon opposite sides of the path of said material, and rotary brush elements within the nozzles and arranged so that their bristles are cleaned by the suction from the nozzles whereby both faces of the material may be brushed and cleaned by suction, and means to rotate said brushes and to reciprocate the nozzles and brushes transversely of the path of the sheet material, said means being arranged to move the brush and nozzle at one side of the path of the material in one direction while moving the brush and nozzle upon the opposite side of said path in the opposite direction.

2. A machine of the class described comprising conveyor means to advance sheet material in its own plane, suction nozzles having mouths disposed adjoining the path of said material, said nozzles being arranged upon opposite sides of the path of said material, rotary brushes disposed within and connected to the respective nozzles, and means to effect the reciprocatory movement of the nozzles and brushes transversely of the path of the sheet material.

3. A machine of the class described comprising conveyor means to move sheet material along a path lying in the plane of the material, suction nozzles having mouths extending across the path of said material, said nozzles being arranged upon opposite sides of the path of said material, whereby both faces of the material may be cleaned by suction, brush elements upon the lips of the nozzles, and means to effect the reciprocatory movement of the nozzles transversely of the path of the sheet material.

4. A machine of the class described comprising conveyor means to advance sheet material in its own plane, suction nozzles having mouths disposed adjoining the path of said material, said nozzles being arranged upon opposite sides of the path of said material, and brush elements associated with the mouths of the nozzles and arranged to brush the material and so that their bristles are cleaned by the suction from the nozzles, and means to reciprocate the nozzles and brush elements transversely of the path of the material, whereby both faces of the material may be brushed and cleaned by suction and whereby the brushes may be cleaned by suction.

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