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2,453,339

SHEET BRUSHING APPARATUS

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2 Sheets-Sheet 1

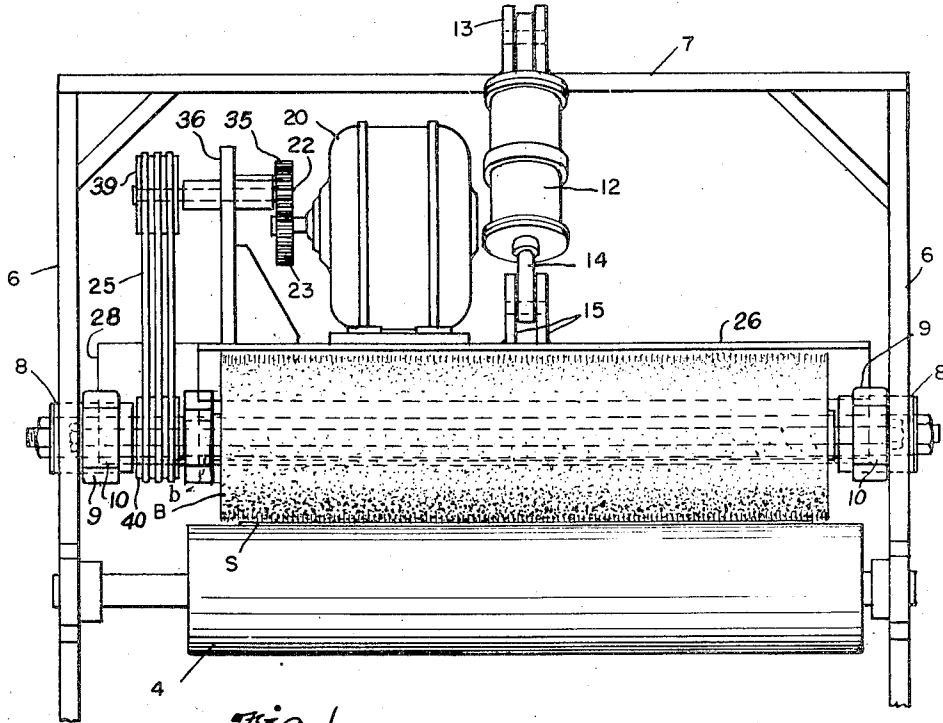


Fig. 1

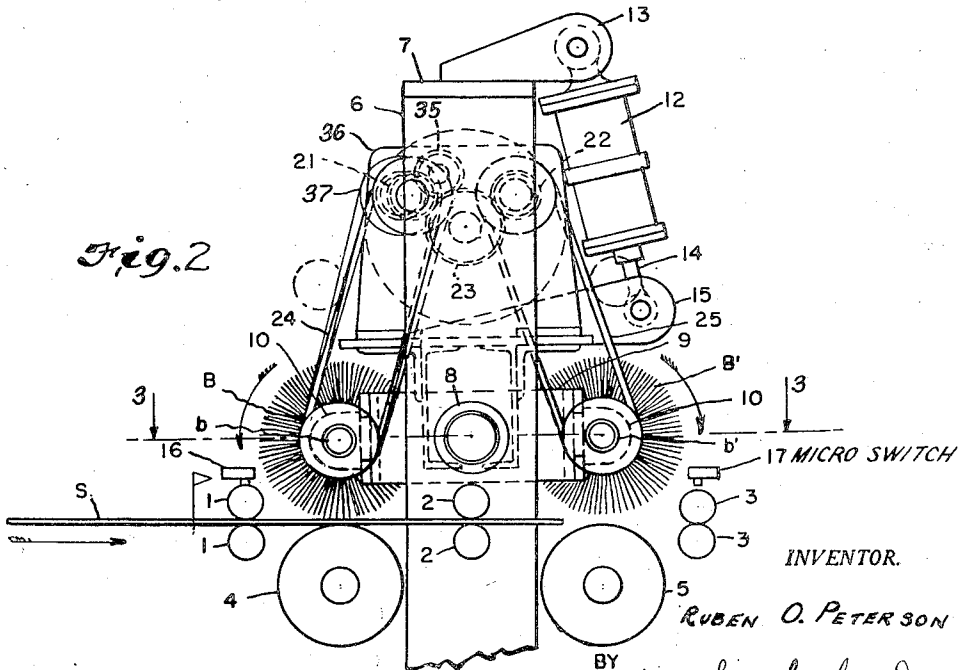


Fig. 2

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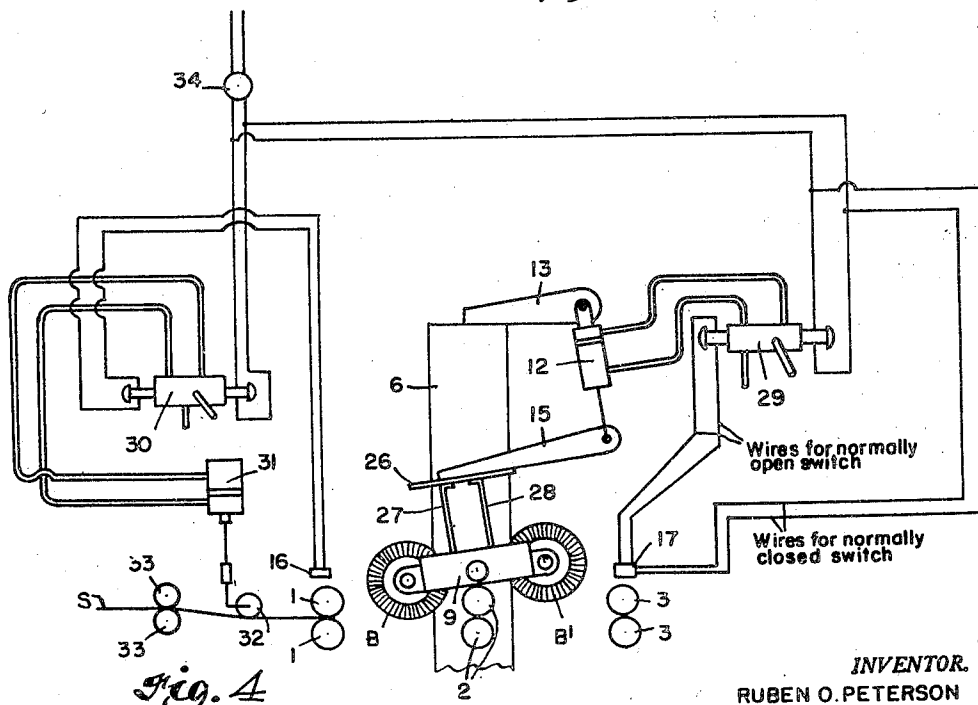
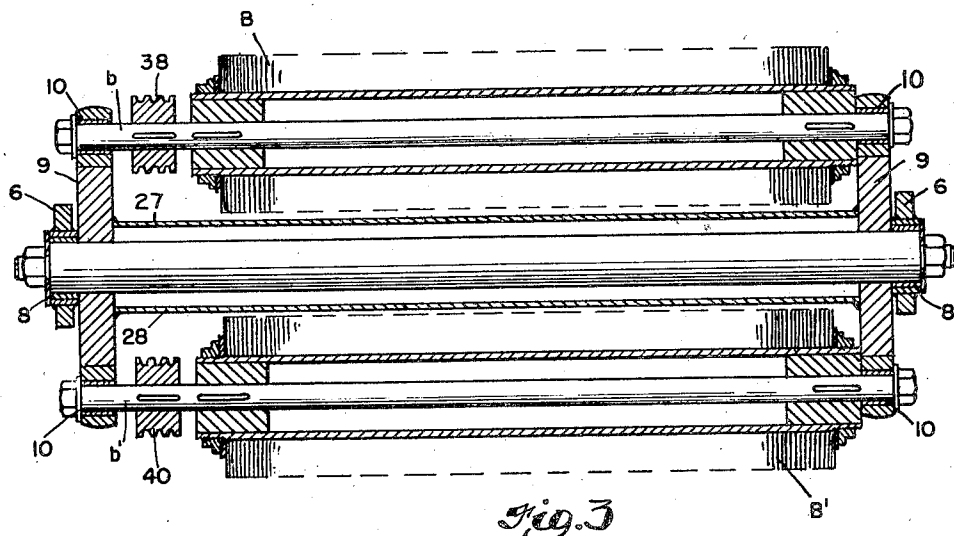
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SHEET BRUSHING APPARATUS

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7 Claims. (Cl. 15-77)

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The present improvements, relating as indicated to sheet brushing methods and apparatus, have more particular regard to the cleaning, polishing, or otherwise processing of the surfaces of individual sheets, either metallic or non-metallic.

The use of rotary or cylindrical brushes for such general purpose is of course well known, especially where the operation is performed or controlled by hand. However, in attempting thus to clean, polish, or otherwise process the surfaces of a succession of sheets by mechanical means, i. e. means in which the operation is carried out more or less automatically, the serious difficulty is encountered that the rotating brush or equivalent member, depending upon its direction of rotation, will pick up or injure either the advance edge of the sheet or the trailing edge. Indeed, the foregoing difficulty will arise in attempting to brush a single discontinuous sheet by passing the same between a suitable support and a brush rotating about an axis fixed in relation to such support.

Heretofore attempts have been made to solve the problem of holding down the trailing edge of a sheet so that it would not catch in a brush thus applied thereto by the use of electromagnets or vacuum holding devices. However, such equipment is not only expensive to install, but by no means certain and uniform in operation. Furthermore, neither such electro-magnetic nor vacuum holding means are adaptable for use in conjunction with a continuous type of sheet feed.

One principal object of the present invention is to overcome the foregoing difficulty. Another object is to provide a simple and compact mechanism for brushing a succession of individual sheets whereby the operation may be carried on practically automatically. A further object is to provide in such an apparatus means for applying the brush to the work under predetermined equable pressure so as to insure uniformity in the resulting treatment.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawing and the following description setting forth in detail certain means and one mode of carrying out the invention, such disclosed means and mode illustrating, however, but one of various ways in which the principle of the invention may be used.

In said annexed drawing:

Fig. 1 is a front elevation illustrating one form of apparatus embodying the present improved

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features of construction and adapted to carry out such improved method of sheet treatment;

Fig. 2 is a side elevation of the same.

Fig. 3 is a horizontal sectional view taken on line 3-3 on Fig. 2; and

Fig. 4 is a diagrammatic layout of the actuating means.

Certain elements of the mechanism thus illustrated in the drawing, and particularly in Fig. 2, are diagrammatically shown since such elements are familiar in sheet handling apparatus. Thus the individual sheets S, of which only one is shown in the figures of the drawing, are designed to be fed in the direction indicated by the arrow applied thereto in Fig. 2 by means of a series of pairs of opposed power driven rolls 1, 1, 2, 2 and 3, 3. It has been deemed unnecessary to illustrate the manner in which such rolls are thus driven or to illustrate the supporting and driving means for two larger backing rolls 4 and 5 which are designed to further support the sheet during the brushing operation, as will be presently described.

Located at an intermediate point in the path of travel of the sheet S as it is moved forwardly by the pairs of gripping rolls and preferably aligned with rolls 2, 2, constituting the intermediate of such pairs, is a frame of general rectangular form from which such brushing mechanism is supported, such frame comprising vertical side members 6, 6 and a transverse member 7 as shown in Fig. 1. Oscillatorily supported in such main frame on trunnion bearings 8, 8 in the side members thereof is a secondary frame 9 which carries two similar rotary cylindrical brushes B and B', the shafts b and b' of which are journaled in pillow blocks 10 on the respective transverse sides of said oscillatory frame 9. The relation of the axis provided by trunnions 8, the diameter of the brushes B and B' and the path of travel of sheet S is such that when said oscillatory frame 9 occupies a horizontal position or a position parallel with such path of sheet travel neither brush will contact with the surface of the sheet. However, upon oscillating the frame in a counterclockwise direction, as viewed in Fig. 2, brush B will be brought into contact with such sheet face, while upon oscillation in a clockwise direction said brush will be raised out of contact and brush B' instead will be brought into contact with the sheet surface.

For the purpose of oscillating frame 9 in order thus to control the position of the brushes and their contact with the sheet which is to be treated, a double acting fluid pressure cylinder 12 is pro-

vided, such cylinder being oscillatorily supported at its upper end from a bracket 13 on cross member 7 of the main frame and the piston rod 14 which projects from the lower end of the cylinder 12 being pivotally connected with an arm 15 that projects from the corresponding side of the oscillatory structure including frame members 9. Such structure comprises an upper plate 26 to which two opposed channel members 27 and 28 are welded (see Fig. 4). The lower end portions of such channel members are welded to members 9 forming a box-like structure oscillatable about trunnions 3. The manner in which such fluid pressure cylinder may be actuated is illustrated in Fig. 4 and described below. However, use of an air cylinder is not recommended because it cannot be satisfactorily controlled for adjusting brushing pressure and the preferred type of device, if air is available, is a so-called "air-hydraulic" cylinder which provides hydraulic control with air power. As indicated, the device should be of a type which will be capable not merely of producing the desired oscillatory movement of frame 9 and of the brushes carried thereby, but of providing desired brush-to-work pressure.

Operation of the actuator which such cylinder 12 with its connections constitutes may be controlled by either a photoelectric cell or a sensitive switch such as a micro-switch, so that the movement of the sheet through the machine will automatically control the position of the brushes B and B'.

Referring more particularly to Fig. 4 of the drawing, the actuating mechanism there illustrated is adapted to operate as follows. A sheet is introduced between drive rolls 33, which may be provided with a slipping clutch, and such sheet advances until it is stopped by roller-footed gate 32 which will be down if, and as long as, a sheet is in process and has not passed roll 3, or if control circuit starting switch 34 is open. Starting switch 34 being closed and no sheet being between rolls 3, valve 30 will be shifted to admit fluid pressure to the lower end of cylinder 31, lifting gate 32. Simultaneously valve 29 is shifted to admit fluid pressure into the lower end of cylinder 12 and thereby rock the brush supporting frame to bring brush B in work contacting position and elevating brush B'. Sheet S advances between rolls 1 and engages brush B which is rotating in the same direction as the movement of the sheet. The passage of the sheet between rolls 1 actuates limit switch 16 to reverse valve 30 causing cylinder 31 to permit roller footed gate 32 to drop and rest upon the upper surface of the sheet. When the leading edge of the sheet passes between rolls 3 the normally open limit switch 17 is closed, causing valve 29 to admit fluid pressure to the upper end of cylinder 12 and thereby moving brush B' into engagement with the sheet rather than brush B. Switch 17 is a double switch, one normally open, one normally closed. When the normally open switch is closed as above the normally closed switch is deenergized. When the tail end of the sheet passes between rolls 3 such normally closed switch will be reenergized to shift valve 30 to raise gate 32 to admit a new sheet. The normally open switch is now deenergized. Simultaneously with the shifting of valve 30 valve 29 is also shifted, causing brush B to be moved into work engaging position. The described cycle will now be repeated.

It will be noted that as indicated by the direction arrows adjacent the respective brushes in Fig. 2, the brush B which is thus first encountered by a sheet as it is fed through the machine is designed to be rotated in a counterclockwise direction, i. e. so that the portion of its face which contacts with the sheet will move in the same direction as the sheet is moving. On the other hand, the other brush B' is designed to be rotated in a clockwise direction so that the portion of its face which contacts with the sheet will move in the opposite direction to that of the sheet travel. Any suitable means may be provided for thus rotating the respective brushes.

As shown in Figs. 1 and 2, a motor 20 may be mounted on the upper surface of plate 26, gear 23 on the motor spindle meshing with gears 22 and 35 carried by upstanding bracket 36. Gear 35 is meshed with a gear 21 also carried by bracket 36. Rotation of such gear 21 serves to turn drive pulley 37 which drives brush B through belts 24 and pulley 38. Rotation of gear 22 turns drive pulley 39 which drives brush B' through belts 25 and pulley 40. It will thus be seen that the two brushes are driven in opposite directions. Since the direction of rotation of the brush is the same as that in which the sheet is moving, there will be no tendency for the part of the brush to raise or damage the forward edge of the sheet, however thin the latter may be, but on the contrary the tendency will be to smooth out such edge. The essential thing is that the sheet should progress through the machine at a uniform rate of speed which is not in excess of the speed of the actuator; that is the sheet should not advance from the point where the first brush stops brushing to the point where the second brush is brought into operative engagement therewith faster than the time interval necessary to raise and lower the brushes by the actuator. Treatment of the entire surface of the sheet by one brush or the other is thus ensured. Furthermore, since the first brush is raised from engagement with the sheet before the trailing end of the latter reaches such brush, the latter will have no tendency to raise or damage such edge, while the second brush, which remains in contact until the final passage of the sheet through the machine, due to the fact that it is rotating in a direction opposite to that of the sheet travel, will likewise have no such tendency, but on the contrary assist in holding down and smoothing out such edge.

While in the foregoing description of the construction and operation of the machine particular reference has been made to the use of brushes as the surface treating means, it will be understood that the principle of the invention is equally adaptable for use with any type of rotary surface treating member such as abrading rolls, buffers, and the like. In other words, the machine may be used by proper selection of such rotary members to clean, polish, or otherwise treat the surface of individual sheets, and as previously stated, the sheets thus treated may be of any material either metallic or non-metallic.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the means and the steps herein disclosed, provided those stated by any of the following claims or their equivalent be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In sheet cleaning and polishing mechanism, the combination of means for supporting and

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feeding individual sheets edgewise, two rotary cylindrical brushes adapted to contact the surface of a sheet thus supported and fed, means adapted to bring said brushes alternately into contact with the sheet, means adapted to rotate the brush, wherewith the sheet first engages, in the direction of sheet travel, means adapted to rotate the other brush in the opposite direction, and means actuated by movement of the advancing sheet operative to time the operation of said means adapted to bring said brushes alternately into contact with the sheet.

2. In sheet cleaning and polishing mechanism, the combination of means for supporting and feeding individual sheets edgewise, a frame mounted for oscillatory movement about an axis transverse of the direction of sheet movement, two rotary members carried by said frame, the axes thereof being located on opposite sides of the latter's axis of oscillation, means for rotating said members in opposite directions, and means adapted to oscillate said frame to bring said members alternately into contact with a sheet being fed.

3. In sheet cleaning and polishing mechanism, the combination of means for supporting and feeding individual sheets edgewise, a frame mounted for oscillatory movement about an axis transverse of the direction of sheet movement, two rotary members carried by said frame, the axes thereof being located on opposite sides of the latter's axis of oscillation, means for rotating said members in opposite directions, means adapted to oscillate said frame to bring said members alternately into contact with a sheet being fed, and means controlled by movement of such sheet operative to actuate said oscillating means.

4. In sheet cleaning and polishing mechanism, the combination of means for supporting and feeding individual sheets edgewise, a frame mounted for oscillatory movement about an axis transverse of the direction of sheet movement, two rotary members carried by said frame, the axes thereof being located on opposite sides of the latter's axis of oscillation, means for rotating said members in opposite directions, means adapted to oscillate said frame to bring said members alternately into contact with a sheet being fed, and means controlled by movement of the sheet operative to actuate said last named means initially to contact the sheet with the member rotating in the direction of sheet movement.

5. In sheet cleaning and polishing mechanism, the combination of means for supporting and feeding individual sheets edgewise, a frame mounted for oscillatory movement about an axis

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transverse of the direction of sheet movement, two rotary members carried by said frame, the axes thereof being located on opposite sides of the latter's axis of oscillation, means for rotating said members in opposite directions, means adapted to oscillate said frame to bring said members alternately into contact with a sheet being fed, and means controlled by movement of the sheet operative to actuate said last named means initially to contact the sheet with the member rotating in the direction of sheet movement and to contact the sheet with the second rotary member before the portion of the sheet contacted by the first member has entirely passed said second member.

6. In sheet cleaning and polishing mechanism, the combination of means for supporting and feeding individual sheets edgewise, a frame mounted for oscillatory movement about an axis transverse of the direction of sheet movement, two rotary members carried by said frame, the axes thereof being located on opposite sides of the latter's axis of oscillation, means for rotating said members in opposite directions, and fluid pressure actuated means adapted to oscillate said frame to bring said members alternately into contact with a sheet being fed and to maintain such contact under predetermined degree of pressure.

7. In sheet brushing mechanism, the combination of means adapted to support and feed individual sheets edgewise, a frame mounted for oscillatory movement about an axis transverse of the direction of sheet movement, two rotary brushes carried by said frame adapted to contact the same surface of such sheet, the axes thereof being located on opposite sides of said frame's axis of oscillation, means operative to rotate said brushes in opposite directions, and means adapted to oscillate said frame to bring said brushes alternately into contact with such sheet with the brush which is rotating in the direction of sheet movement contacting the leading edge portion of such sheet and the brush which is rotating contrary to the direction of sheet movement contacting the trailing edge portion of such sheet.

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