HOUSING ASSEMBLY FOR ELECTROSTATIC PRINTING MACHINE

Inventor: William A. Lloyd, San Jose, Calif.
Assignee: Versatec, Inc., Cupertino, Calif.
Filed: May 11, 1972
Appl. No.: 252,425

U.S. Cl. .............................................. 312/39
Int. Cl. .................................................. B65h 19/00
Field of Search .................. 312/39, 208, 296, 352;
220/46 R; 48/483; 242/55.53

References Cited
UNITED STATES PATENTS
3,363,959 1/1968 Sames................................. 312/39 X


Primary Examiner—James C. Mitchell
Attorney, Agent, or Firm—Fehr, Hohbach, Test,
Albritton & Herbert

A housing assembly for an electrostatic printing machine features: a sealed chamber for storage of a supply of printing material in either fan-fold or roll form; means for tensioning a web of the material as it is fed to an electrostatic printing head; and a broad leaf member extending transversely of the bin assembly between a supply of fan-fold web material and the tensioned web itself as stretched out to the recording head so as to prevent rubbing contact therebetween.

9 Claims, 13 Drawing Figures
HOUSING ASSEMBLY FOR ELECTROSTATIC PRINTING MACHINE

BACKGROUND OF THE INVENTION

This invention pertains to a printing machine and particularly to a housing assembly particularly useful with electrostatic printers.

In general, it is an object of the present invention to provide an improved housing assembly and associated apparatus of simplified construction at minimal cost as may be particularly useful for electrostatic printing machines.

The quality of electrostatic printing can be substantially affected by atmospheric extremes of humidity, etc. However, the provision of a sealed enclosure for the specially treated printing paper used has not been particularly practicable heretofore.

In addition to the above, electrostatic printing paper has been generally available in each of two forms, i.e., in roll form or in "fan-fold" form in which successive page lengths of paper are folded back and forth to provide a stack of pages from a continuous length of paper. It is desirable, though not always possible, to provide machine capability for readily handling either type of paper supply with the same housing assembly.

OBJECTS

It is an object of the present invention to provide an improved printing machine housing solving the foregoing and other problems.

It is another object of the invention to provide an electrostatic printing machine paper supply housing atmospherically sealed.

Another object of the invention is to provide an improved printing machine housing containing means for accommodating both fan-fold paper supply and roll style paper supply.

Another object of the invention is to provide a machine of the kind described in which a fan-fold web of paper is protected against inadvertent rubbing between portions of the web so as to cause smudging of the web.

SUMMARY OF THE INVENTION

In general, there has been provided a printing machine housing assembly for containing a supply of printing material, such as treated paper, in atmospherically sealed condition for delivery therefrom to a printing station. The paper is maintained in a sealed storage chamber comprising a bin assembly and a closure assembly pivotally coupled thereto. The bin assembly includes a receiving zone adapted to loosely receive a supply of paper or other printing material therein. Means forming a sealed interface between the two assemblies and extending around the two assemblies for sealing the storage chamber defined within the two assemblies includes resilient strips carried by and bounding the periphery of one of the assemblies and elongate rigid supports carried by and bounding the periphery of the other of the assemblies in position to engage the resilient strips in sealing relation therebetween.

More particularly, and in accordance with a number of features of the invention, an elongate knife edge element is carried by one of the assemblies to extend transversely of the bin assembly in a manner whereby one of the elements can move in a path into and out of sealing engagement with the other of the elements and thereby form a portion of the sealed interface enclosing the two assemblies.

In addition, paper tensioning means are carried from the underside of the closure assembly for pressing the web against a guide element disposed to extend transversely of and above the supply of paper to apply a drag to the paper being withdrawn from storage. Further, inspection ports are formed in one of the assemblies and resilient closure diaphragms are atmospherically sealed in a readily releasable manner in these ports so as to provide pressure relief therethrough in the event that pressure of gases may be generated within the enclosed chamber.

A further feature provides a transversely extending leaf member in the bin assembly and disposed between the supply of paper and the web to prevent rubbing contact between the underside of the web and the topside of paper being withdrawn from a fan-fold supply of paper within the sealed chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a perspective view of the inner housing assembly for an electrostatic printing machine according to the invention;

FIG. 2 shows an enlarged side elevation detail section view taken along the line 2—2 of FIG. 1;

FIG. 3 shows a side elevation view with portions broken away and in section showing housing assembly for a printing machine according to the invention;

FIG. 4 shows an elevation section view in enlarged detail taken along the line 4—4 of FIG. 3;

FIG. 5 shows a perspective view with portions partially broken away for clarity of an electrostatic printing machine housing according to the invention;

FIG. 6 shows a perspective view in reduced scale showing the inner and outer housings for a printing machine employing electrostatic recording paper;

FIG. 7 shows a side elevation section view of the inner housing assembly for an electrostatic printer according to the invention;

FIG. 7A shows an enlarged detail perspective elevation view of a portion of FIG. 1 in the region designated 7A;

FIG. 7B shows in enlarged detail a side elevation view of the portion of FIG. 7 in the region of the roller guide element and weighted leaf member, has been inserted as the last paragraph on the page.

FIG. 8 shows a perspective view of a portion of the housing assembly according to the invention with portions broken away for clarity;

FIG. 9 shows an enlarged side elevation section view of a retaining pin and retaining key taken along the line 9—9 in FIG. 8 according to the invention;

FIG. 10 shows in enlarged detail a section view of FIG. 1 taken along line 10—10; and

FIG. 11 shows an end elevation section view of the detail showing the inner housing assembly in its closed position and loaded with a roll of printing paper.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

As shown generally in FIG. 6, the printing machine 10 is characterized by inner and outer housing assemblies 11, 12 respectively which are each hinged for independent movement. Housing assembly 11 contains a
supply of electrostatic printing material, such as the roll 13 of treated paper or the stack 68 (FIG. 7) of paper arranged in a fan-fold style, wherein a length of paper is folded into a number of page lengths successively disposed upon each other.

Inner housing assembly 11 is believed best shown in FIG. 1 wherein a bin assembly 16 includes bottom panels 17, 18, side walls 19, a front end wall 21, and a back end wall 22.

A roll 13 of paper of a type, for example, having a hollow core 15 containing an X-shaped support member 23 which extends from each end of roll 13 can readily be supported for rotation upon member 23, loosely inserted into core 15, and supported at its ends within bin assembly 16 by means of the L-shaped support brackets 24 carried on the upper end of side wall extensions 26.

As thus arranged, the ends of the X-shaped core insert or support member 23 rest unattached on the horizontal portion of L-shaped brackets 24 and X-member 23 is retained thereon at one side by the upwardly extended arm 24a and at the other side by the upwardly extending lip 24b.

A closure assembly 27 includes a top panel 28 of semi-rigid material, such as sheet metal, bent to include a number of sub-panels thereof disposed at different angles to each other (FIG. 3).

Closure assembly 27 further includes side walls 29 and an end wall 31 secured to said top panel 28 by suitable means such as welding or riveting or the like.

Means pivotally coupling the closure assembly 27 to bin assembly 16 for movement of the former between closed and open positions relative to the latter have been provided (FIG. 2). Thus, a hinge rod 32 is disposed between rearwardly extending side flange portions 33 at the back of bin assembly 16 and extend through a pair of downwardly extending side wall extension portions 34 disposed at both sides of closure assembly 27.

Accordingly, closure assembly 27 is readily movable between open and closed positions for exposing the interior of the bin assembly 16 for receiving a load of paper or other recording web material to be disposed therein. Springs 36 wrapped about the ends of rod 32 and formed with elongated end arms 36a, 36b serve to provide an assist to the opening movement of closure assembly 27.

Accordingly, spring end 36a engages a small stud 37 attached to side wall 19 for arresting the rotational movement of spring end 36a. The other end 36b engages the lower portion of the edge of side wall 29 of closure assembly 27 and, by mounting spring 36b about the outer ends of rod 32, a spring assist lifting force can be applied to the raising of closure assembly 27.

Means forming a sealed interface surrounding housing 11 between assemblies 16 and 27 and extending therearound so as to seal the storage chamber from atmospheric conditions includes resilient gas-tight strips 38 carried by and bounding the periphery of assembly 27 and elongate rigid supports, such as the flanges 39 carried by and bounding the periphery of bin assembly 16 in position to engage strips 38 in sealing relation therebetween. As thus arranged, the strips 38 pivot downwardly about the axis of rotation of rod 32 until strips 38 rest snugly upon flanges 39 to provide an atmospheric seal therebetween.

The front and back of bin assembly 16 must also be sealed against atmosphere and, accordingly, as disclosed herein, means forming an elongate knife edge element carried by one of the two assemblies 16, 27 extends transversely of bin assembly 16 while a resilient seal strip element is carried by the other of the two assemblies to extend transversely of the bin assembly.

One of the two elements, either the knife edge element or the resilient seal strip element, is disposed to move in an arcuate path into and out of sealing engagement with the other of the two elements so as to form a portion of the sealed interface enclosing the periphery of housing 11.

Accordingly, as best shown in FIGS. 1 and 2, an elongate knife edge element 41 consisting of a rearwardly bent flat continuous flange portion of the back wall 22 extends between side walls 19 (or side wall extensions 26) to lie in the arcuate path of a resilient gas-tight seal strip 42 of suitable material, such as rubber or plastic, secured to extend across the back of end wall 31 of top closure assembly 27 to be carried thereby arcuately along the path 43. Thus, it can be seen that there is a sharp knife edge action serving to seal the back or rear edge of the chamber in which the treated paper is to be maintained.

At the front of housing 11, an electrically insulated smooth rod-like lip element 44 of suitable lightweight nonconductive material, such as a polymerized methyl methacrylate thermoplastic resin, such as sold under the trademark Lucite by E. I. de Pont de Nemours and Company, is disposed to extend transversely across bin assembly 16 in the path of the web 46 and at the discharge edge of bin assembly 16 so as to support web 46 from beneath during passage of the web from the sealed chamber.

Means are provided for forming a seal at the discharge opening for web 46 including an elongate, broad, plant, resilient sealing strip 47 substantially coextensive with the length of lip element 44 and carried by closure assembly 27 in position to be disposed to yieldingly lie upon the web as the web passes across lip element 44 when closure assembly 27 is disposed in its closed position.

Accordingly, the sealing strip 47 consists of a thin, flexible, nonconductive strip of material.

Immediately downstream of lip 44, a transversely extending recording head 48 is disposed of the type including a number of electrically operative pin-like probes 49 which, when properly activated, serve to record electrostatic charges upon web 46.

As best shown in FIG. 7, recording head 48 serves to electrically condition the undersurface of web 46 whereby as web 46 passes further downstream, an electrostatic charge-developing fountain 51 serves to engage web 46 for development of the electrostatic charges remaining thereon.

One such fountain is shown and disclosed in copending application Ser. No. 93,256, assigned to the Assignee herein.

In order to advance web 46 along its path, a pair of rollers 53, 52 engage the edge margins of web 46 and, by means conventionally known to those skilled in the art (not shown herein), the drive rolls 52 serve to advance paper from web 46 through the system. The web is advanced backwardly and directed upwardly along an inclined platen 54 also as disclosed in the above identified copending application. Means for tensioning
web 46 as it is drawn through the system includes an elongate roller or guide element 56 mounted for rotation and movement transversely of the bin assembly 16 is supported between the side walls of bin assembly 16 for passing the web therearound. Roller 56 is coated with a low friction plastic which provides a quick “release” of the web therearound whether the web is pulled from the left or right side of stack 68 (FIG. 7), i.e., regardless of the angle at which the paper approaches roller 56.

The side edges of the web 46 engage and are guided by the flat surfaces of guide plates 55 closely adjacent the ends of roller guide element 56.

Means carried from the underside of closure assembly 27 serve to press web 46 against guide element 56 so as to impart a drag to the web as it is delivered from the sealed chamber through the opening defined between lip 44 and sealing strip 47.

Accordingly, a broad leaf member 57 is loosely hinged to the underside of closure assembly 27 by means of the two spaced bolts 58 with heads which are spaced from member 57 sufficiently to permit loose hinge movements. The top surface of leaf 57 carries an elongate weight 59 secured thereto, such as a steel bar, so as to urge leaf 57 yieldingly into engagement with web 46 as it travels around guide 56.

From the foregoing, it is readily evident that the free or distal edge of leaf member 57 pivots downwardly in a path including guide element 56 as closure assembly 27 is lowered. In this manner, it will ride freely on web 46.

Inspection ports 61 are formed in each of side walls 29 whereby functioning of the equipment in operation can be observed. However, in order to maintain the enclosure sealed from atmosphere under normal operation, resilient closure diaphragms 62 are atmospherically sealed and readily releasably disposed in ports 61 so as to form a pressure relief region in the otherwise closed system. For example, in the event that certain escaping vapors and gases from treated papers employed in an electrostatic printer are captured within the sealed chamber and a spark occurs, it is possible under just the right conditions to create a low level explosion and the pressure relief closures 62 or diaphragms are readily blown from their positions in ports 61 so as to provide pressure relief and avoid damage to the equipment.

Thus, as shown best in FIG. 10, the periphery of each of the resilient closure diaphragms 62 includes a groove 63 extending around the periphery for engaging the inner edge of the opening formed by ports 61.

As noted above, bin assembly 16 serves to contain a supply of web material in either roll form 13 or as arranged in fan-fold form shown best in FIG. 7. As shown in FIG. 7, the web 46 of paper is trained about guide element 56 but the span between guide 56 and lip 44 is depressed from above by means of the transversely extending ribs 64 formed at the bends in the top panel 28. Ribs 64 serve to draw web 46 downwardly to a position where it passes upwardly and over the lip 44 and then downwardly to head 48. This angle of attack or angle of entry for web 46 into the discharge passageway defined between lip 44 and sealing strip 47 serves to mechanically isolate the paper supply from the pulling forces on the web.

By disposing the web in this advantageous manner, however, it has been observed that occasionally the un-
fork element 76, carried from the light chain 77 attached to wall extension 26 adjacent button 71, can be interposed between the flanged head portion 71b and housing 72 so as to return button 71 retracted from the path of the side edge of the fan-fold web.

Further, in feeding the web stepwise across recording head assembly 48, it is important that each acceleration of the web be isolated from the inertial drag applied thereto by roll 13 and that the movement be smooth and consistent. Accordingly, a spring-loaded bar 81 formed with crank ends 81a at each end is pivoted by insertion into a hole formed into side walls 29. A helical spring 82 is carried at each end about a bushing 83 whereby bar 81 is biased downwardly beneath top closure 28 (as shown in FIG. 7) until engaging fixed stop pins 84 carried in walls 29.

The top of web 46 engages bar 81 when assembly 27 is closed and, therefore, as the web is advanced, it first serves to depress bar 81 and later tugs on roll 13. In this way, the "load" which the web experiences remains substantially the same and the large inertial load experienced by the paper driving mechanism is removed so that sharp discrete steps of movement do not appear.

This feature is highly desirable as it eliminates many problems such as slippage at the drive rolls, paper tearing due to excess tension, etc.

1. In an electrostatic printing machine of a type employing a web of printing material to be fed to a printing station for recording upon the web, a housing assembly including a storage chamber for containing a supply of said material in atmospherically sealed condition for delivery therefrom to said station, said chamber comprising a bin assembly having bottom, side and end walls secured thereto to form a receiving zone adapted to loosely receive therein a supply of said web material, a closure assembly including a top panel and side and end walls secured thereto, means pivotally coupling said closure assembly to said bin assembly for movement of the former between closed and open positions relative to the latter, and means for forming an atmospherically sealed interface between said assemblies and extending around said assemblies for sealing the storage chamber from the atmosphere, said sealed interface including resilient strips carried by and bounding the periphery of one of said assemblies and elongate rigid supports carried by and bounding the periphery of the other of said assemblies in position to engage said resilient strips in sealing relation therebetween.

2. In an electrostatic printer machine having a housing according to claim 1 including means forming an elongate knife edge element carried by one of said assemblies to extend transversely of said bin, a resilient seal strip element carried by the other of said assemblies and extending transversely of said bin assembly, one of said elements being disposed to move in a path into and out of sealing engagement with the other of said elements to form a portion of said sealed interface.

3. In an electrostatic printing machine having a housing according to claim 1 and including an electrically insulating lip element carried by said bin assembly to extend transversely of the path of said web of material and disposed at the discharge edge of said bin assembly to support said web from beneath during passage of said web from said chamber, and an elongate, pliant, resilient sealing strip substantially coextensive with said lip element and carried by said closure assembly to be disposed to yieldingly lie upon said web as said web passes across said lip element when said closure assembly is disposed in its said closed position.

4. In an electrostatic printing machine having a housing according to claim 1 including an elongate guide element extending transversely of said bin assembly and supported between the side walls of same for passing said web around said guide element and means carried from the underside of said closure assembly for pressing said web against said guide element to impart a drag to said web as it is drawn from said chamber.

5. In an electrostatic printing machine having a housing according to claim 4 wherein the last named means includes a broad leaf member hinged to the underside of said closure assembly, the distal edge of said leaf member moving in a path including said guide element and engaging said web transversely about same when said closure assembly is moved to its said closed position and means carried by said leaf member for urging said leaf member toward said guide element to apply a drag to said web passing thereacross.

6. In an electrostatic printing machine having a housing according to claim 1 further comprising inspection ports formed in one of said assemblies and resilient closure diaphragms atmospherically sealed readily releasably in said ports to afford pressure relief within said chamber.

7. In an electrostatic printing machine having a housing according to claim 3 in which said bin assembly serves to contain a supply of web material disposed in fan-fold condition, further comprising an elongate guide element extending transversely of said bin assembly and means for supporting said guide element above said supply of web material and remote from said lip element for supporting a length of said material as a web extending between said lip element and said guide element, and a leaf member extending transversely of said bin assembly between said supply and said web to prevent rubbing contact therebetween.

8. In an electrostatic printing machine of a type employing a web of printing material to be fed to a printing station for recording upon the web, an open topped bin assembly containing supply of said material in fan-fold condition, an elongate guide element extending transversely of said bin assembly, means supporting said guide element above said supply at one end of said bin assembly, an elongate electrically insulative lip element disposed in substantially parallel spaced relation to said guide element and at the other end of said bin assembly for supporting a length of said material as a web to extend between said lip and guide elements, a bar extending transversely of and beneath said web, and means supporting said bar to ride freely upon the top of said supply for maintaining a spaced relation between said web and said supply to prevent rubbing contact between the surfaces thereof.

9. In an electrostatic printing machine according to claim 8 further including a U-shaped bracket readily removably disposed in said bin and having upwardly extending arms bounding the side edges of said web material, means pivotally coupling a transverse edge of said bar to extend between said arms of the bracket and to permit a portion of said bar to freely ride up and down on the top of said supply.

* * *