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CONSTANT LEVEL INKING SYSTEM

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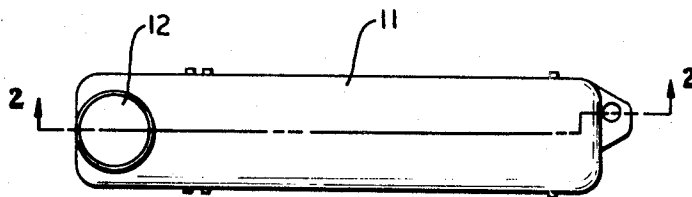


Fig. 1.

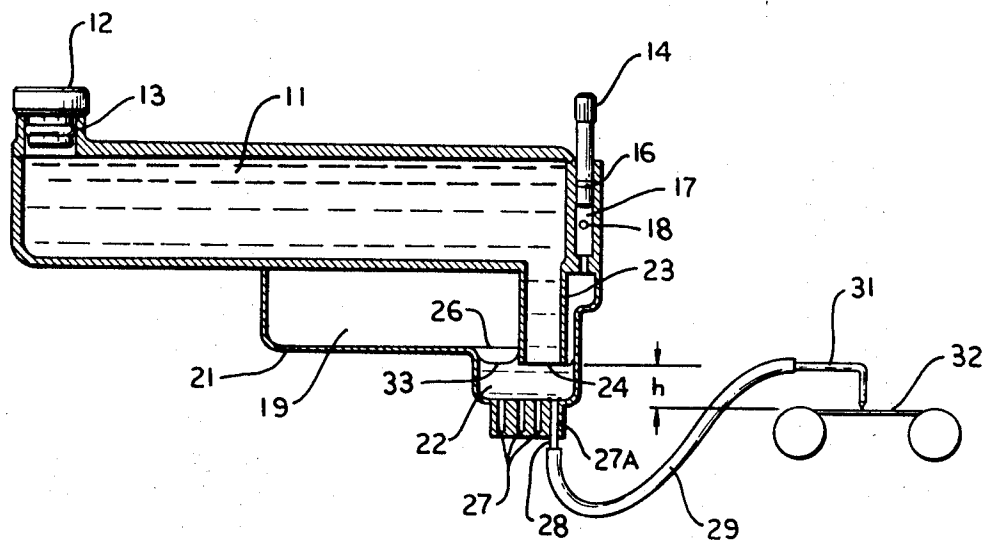


Fig. 2.

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CONSTANT LEVEL INKING SYSTEM

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9 Claims

ABSTRACT OF THE DISCLOSURE

In a chart recorder, an ink reservoir of constant volume and large capacity is sealed from atmosphere, is connected to a small volume sump below it by a connecting tube, ink feed to the pen being taken from the sump, occasional unsealing of the connecting tube at the ink surface in the sump permitting an air bubble to enter the reservoir and allow re-establishment of the ink level in the sump by ink from the reservoir.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates generally to chart recording instruments of the ink-writing type, and more particularly to an inking system therefor of comparatively large capacity.

Description of the prior art

In the various arts, a variety of inking systems is known. Some examples are found in the following patents: 3,252,164, Herte et al., May 17, 1966; 3,277,495, Caldwell, Oct. 4, 1966; 2,702,369, Dreyfus, Feb. 15, 1955. Another Pat. No. 3,145,653 issued to Lake on Aug. 25, 1964 deals with a supply system for various cleaning and treating fluids associated with copymaking machines.

In these patents, the Caldwell patent is the only one dealing with an ink supply system and expressing concern over uniformity of supply of ink independent of level of ink in the reservoir. However, the unit must be inverted in order to refill it, relies on capillary action in grooves 38 which can be exposed to air, with consequent interference with proper operation. There has remained a need for a convenient, trouble-free inking system and it is to that end that the present invention is directed.

SUMMARY OF THE INVENTION

Described briefly, in a typical embodiment of the present invention, a sealed reservoir of comparatively large volume has an outlet in a small volume sump with ink in the sump sealing the outlet, an ink feed line being connected from the sump to a pen.

BRIEF DESCRIPTION OF THE DRAWINGS

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

FIG. 1 is a top plan view of an ink reservoir according to a typical embodiment of the present invention.

FIG. 2 is a section therethrough taken at line 2—2 in FIG. 1 and viewed in the direction of the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail, and particularly FIG. 1, the reservoir 11 is generally rectangular and elongated in shape. It has a filling cap 12 which can be removed with the fingers for replenishment of the ink supply in the reservoir. The cap includes an O-ring seal 13 to assure fluid-tight sealing at this location. A vent

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control pin 14 is received in the supply body and has an O-ring 16 thereon to provide a seal in the bore 17.

The bore 17 has a vent hole 18 in the wall thereof, and the lower end thereof communicates with an expansion chamber 19 below the reservoir 11 and of the same width as the reservoir, but of considerably shorter length. At the lower wall or bottom 21 of the expansion chamber and at the end thereof, is a sump 22 of a very small area and volume as compared to that of the expansion chamber and the reservoir.

A connecting tube 23 projects below the end of the reservoir, through the expansion chamber and into the sump 22. The lower marginal edge 24 of the connecting tube extends slightly below the level 26 of the bottom of the expansion chamber. The bottom of the sump is provided with a plurality of passageways, 27, all of which are blind except for passageway 27A which receives a tube 28 to which the ink feed capillary tube 29 is connected, the other end of the tube 29 being connected to the pen 31 marking the chart 32.

In the use of the system, the vent control pin 14 is moved downwardly to close the opening 18 or isolate it from communication with the expansion chamber. Then the cap 12 is removed and the reservoir filled with ink. It is preferable that the pen be above the level of the reservoir during this filling operation.

When the reservoir is full, the cap is installed. Once the cap is sealed, the vent pin can be raised to provide communication between the expansion chamber and the atmosphere. The sump will fill with ink from the reservoir and the free surface of the ink in the sump will be about even with the lower edge 24 of the connecting tube as indicated at 33. The distance h between this level and the pen point level is the normal head height of the system and will remain virtually constant. This is because, as ink is drawn from the sump by the pen, it will occasionally uncover the outlet end of the reservoir connecting tube and permit an air bubble to move upwardly into the reservoir and replace enough ink to replenish the sump.

The expansion chamber allows for displacement of ink during temperature rises in air which has been admitted to the reservoir through the outlet opening of the connecting tube 23. Because the connecting tube is only large enough to permit an air bubble to rise in it to replace ink for replenishment of the sump, the diameter of this tube and of the sump can be comparatively small. Accordingly, the ink evaporation which occurs is limited to that which can occur from the area of the surface exposed in the sump. Accordingly the evaporation is minimized.

The ink level established in the sump under static operating conditions is a function of the ink column height pressure being opposed by atmospheric pressure acting on the surface of the ink in the sump. If the ambient temperature rises at a faster rate than the writing system consumes ink, the air contained in the reservoir expands. This displaces ink into the sump which causes the level to rise. The amount of ink displaced is proportional to the degree of temperature rise and the volume of air contained in the reservoir. By having the expansion tank bottom level slightly above the normal ink level in the sump, a considerable amount of ink can be displaced due to temperature effects without any significant change in the head height.

The purpose of the manifold passages 27 in the bottom of the sump, is to facilitate addition of tubes like tube 28 to supply a group of pens. It is only necessary that the thin lower wall of the passage be punctured for insertion of such additional tubes.

Because of the nature of the construction and arrangement of the various chambers and passageways, the supply

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unit of the present invention can readily be made of molded halves cemented or otherwise secured together along a parting line at the cutting plane of the section illustrated in these drawings. If desired, the offset shown in FIG. 1 need not be incorporated in the molded parts, because the bore 17 can be achieved after molding. 5

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in this art and within the broad scope of the invention. 10

The invention claimed is:

1. An inking system comprising:

a sealed reservoir having an outlet; 15
a sump disposed at said outlet for containing ink in a quantity that is small compared to the volume of said reservoir, to provide an ink seal at said outlet; an ink feed line connected to said sump to receive ink therefrom; 20

and a normally-unvented filler cap removably mounted and sealed to said reservoir above the level of the ink surface in said reservoir;

and valve means operable to control flow of ink from said reservoir to said sump during filling of said reservoir. 25

2. The system of claim 1 wherein:

a pen is connected to said feed line, said pen having a writing point at a level slightly below the level of ink in said sump. 30

3. The system of claim 1 wherein:

said reservoir is of substantially constant volume, ink dispensed therefrom being replaced by gas admitted through said outlet from above the ink surface in said sump. 35

4. The system of claim 1 and further comprising:

a plurality of passageway means in said sump to facilitate connection of a plurality of pens thereto.

5. An inking system comprising:

a sealed reservoir having an outlet; 40
a sump disposed at said outlet for containing ink in a quantity that is small compared to the volume of said reservoir, to provide an ink seal at said outlet; an ink feed line connected to said sump to receive ink therefrom; 45

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and an expansion chamber associated with said sump and having a lower margin of substantial area at a level near and above the level of said outlet to permit expansion of ink from said sump into said chamber without significant change of head on the ink in said feed line.

6. The system of claim 5 wherein:

said outlet is at the bottom of a connector tube extending from the bottom of said reservoir downward through said expansion chamber into said sump, the horizontal area of said reservoir being much greater than that of said expansion chamber, and the horizontal area of said sump around said connector tube being much less than that of said expansion chamber, to minimize evaporation of ink.

7. The system of claim 5 and further comprising:

a vent passageway communicating with said expansion chamber and extending upwardly therefrom;

a vent port in a wall of said passageway;

a vent control member slidably received in said passageway and having a seal thereon sealingly engaged with the wall of said passageway, for selectively communicating or precluding communication of said expansion chamber with atmosphere.

8. The system of claim 7 and further comprising:

a ventless filler cap removably mounted and sealed to the top of said reservoir.

9. The inking system of claim 1 and further comprising: vent means communicating with said sump and normally venting said sump to atmosphere;

said valve means being disposed in said vent means and closeable to seal said sump from atmosphere during removal of said filler cap.

References Cited

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