United States Patent [19]

Wogoman et al.

[11] **3,874,022**

[45] **Apr. 1, 1975**

[54] **MEANS FOR REMOVING INK FROM A SCREEN AND INCLUDING A CLEANING HEAD AND ACCUMULATOR**

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[22] Filed: **Mar. 19, 1973**

[21] Appl. No.: **342,740**

[52] **U.S. Cl.** **15/321,** 134/10, 134/21

[51] **Int. Cl.** **A47l 7/00**

[58] **Field of Search** 134/21, 34, 10, 13; 15/320, 321, 322

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[57] **ABSTRACT**

Ink is removed from the screen utilized in a silk screen printing process by positioning a cleaning head having first and second orifices over the screen. A vacuum is drawn at one of the orifices of the cleaning head and causes the cleaning solvent to be withdrawn from the other orifice across the cleaning head in contact with the screen, thus causing ink particles to be removed from the screen and transported in the solvent to a depository.

4 Claims, 5 Drawing Figures

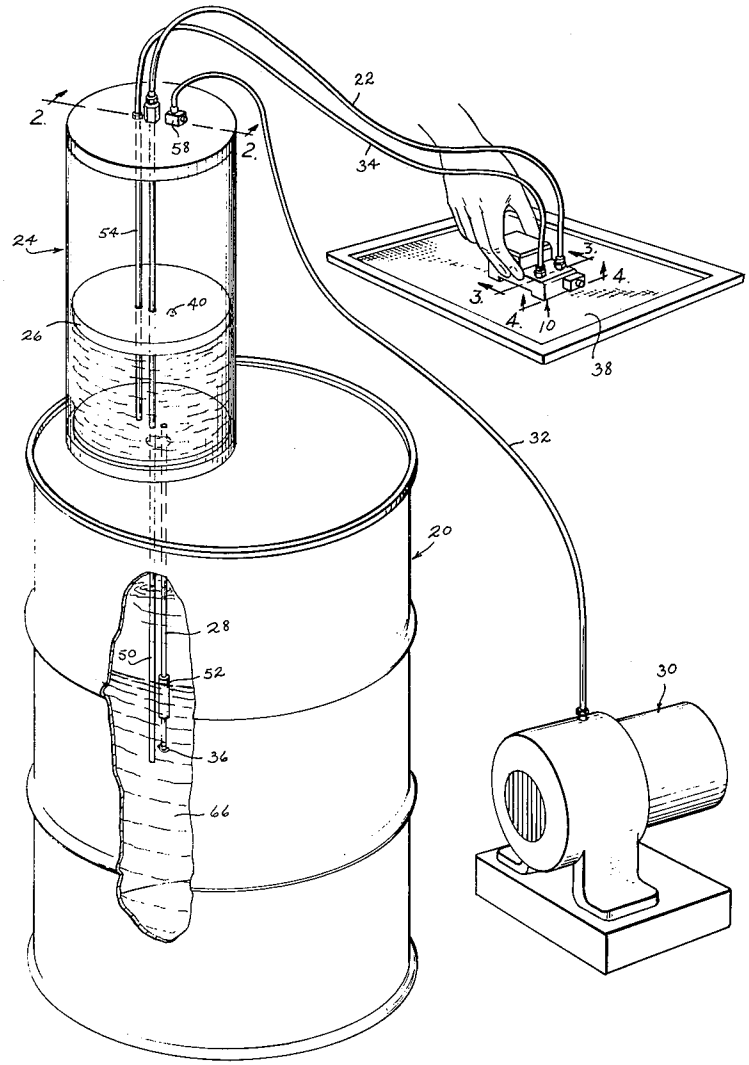


Fig. 1

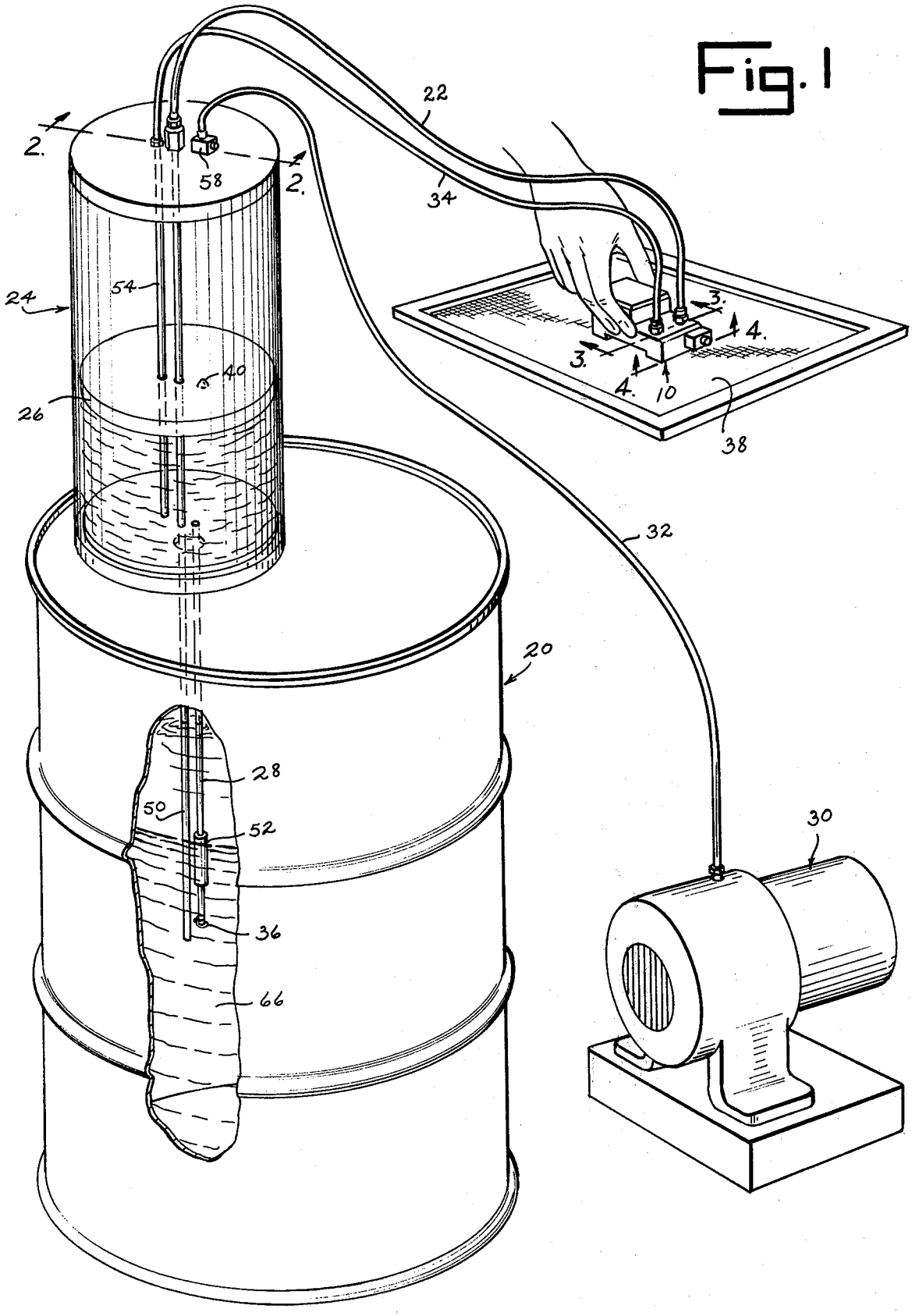


Fig. 2

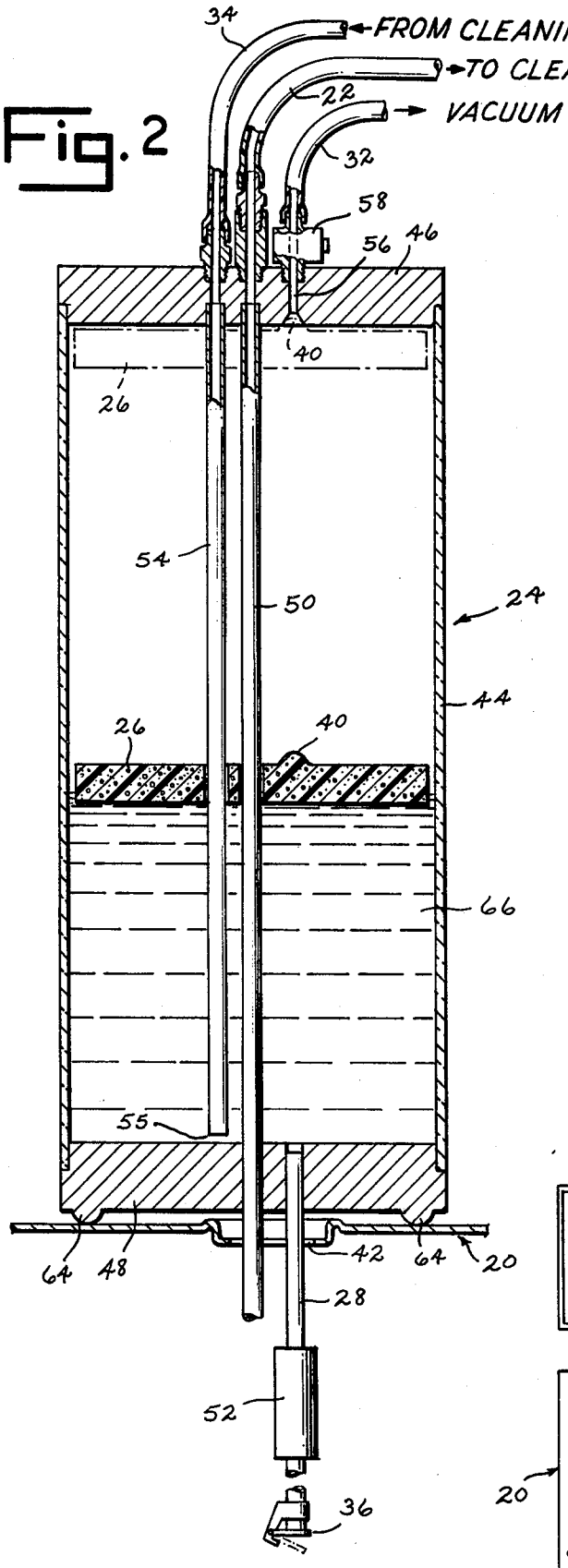


Fig. 3

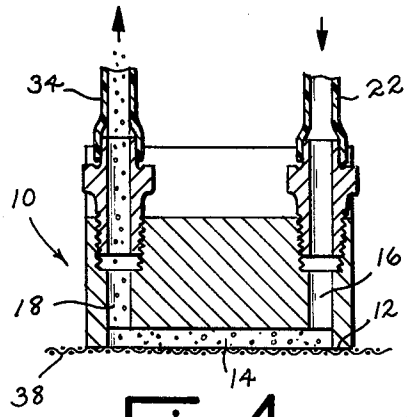


Fig. 4

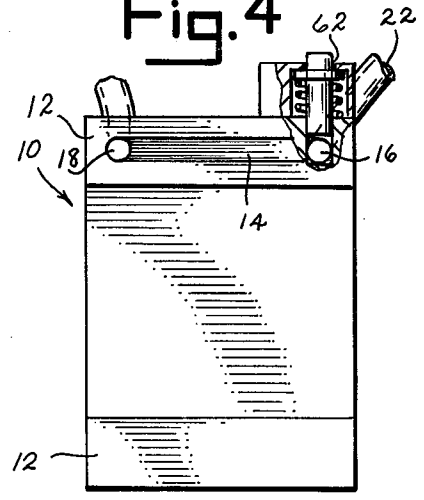
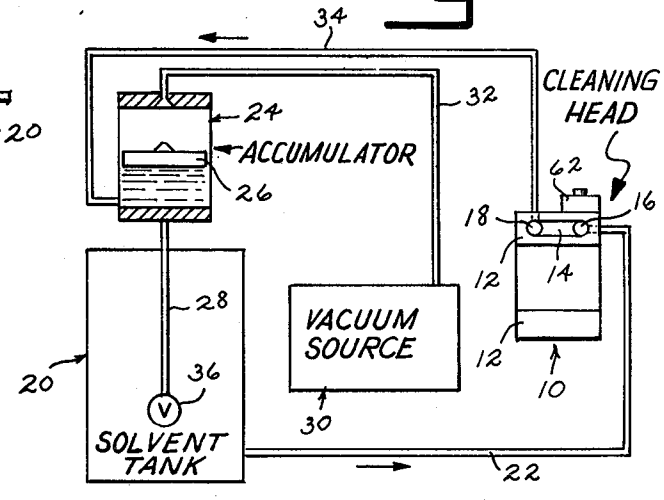


Fig. 5



MEANS FOR REMOVING INK FROM A SCREEN AND INCLUDING A CLEANING HEAD AND ACCUMULATOR

BACKGROUND OF THE INVENTION

This invention relates to a method and means for removing ink from the screen utilized in a silk screen printing process.

Printing by means of the silk screen process has been utilized for centuries. The early screens utilized in such a process were of finely interwoven silk, while the screens used today in the process are of stainless steel, polyester, nylon or similar plastic material fibers in addition to silk. Heretofore, the normal practice of cleaning such screens, whether of silk, steel or plastic material, has been by applying solvent directly to the screen by hand and removing by wiping with lint free cloth. This results in the ink getting on one's hands and even one's clothing, thus constituting a rather messy, time-consuming and undesirable job. The direct contact of the wiping cloth accelerates the breakdown of the emulsion used on the screen.

The method and apparatus of this invention allows the screen utilized in a silk screen printing process to be cleaned in a rapid, simplified and tidy manner.

SUMMARY OF THE INVENTION

The method of this invention relates to the removal of ink from the screen utilized in a silk screen printing process and contemplates the use of a cleaning head having spaced first and second orifices therein. The cleaning head is positioned over the screen, preferably in contact therewith, with the first and second orifices overlying the screen in close proximity. A vacuum is provided at the second orifice which causes solvent to be drawn from the first orifice, across the surface of the screen and into the second orifice after which, along with the ink removed from the screen, the solvent is deposited in an accumulator. The flow of solvent across the screen can be stopped by simply removing or lifting the cleaning head from the screen. By interrupting the vacuum to the second orifice in the cleaning head, the solvent and ink collected in the accumulator will pass into a tank or drum where the ink will settle to the bottom of the tank and the solvent recirculated across the surface of the screen upon resumption of the vacuum.

Means are provided by which the solvent flow from the first orifice in the cleaning head can be terminated while maintaining a vacuum at the second orifice to remove any excess solvent from the screen such as at termination of the cleaning process.

Accordingly, it is an object of this invention to provide a method of removing ink from the screen utilized in a silk screen printing process.

Another object of this invention is to provide a method of removing ink from the screen utilized in a silk screen printing process through means of drawing a cleaning solvent across the surface of the screen.

Still another object of this invention is to provide a method of removing ink from a screen utilized in a silk screen printing process in a tidy and efficient manner.

Another object of this invention is to provide apparatus for removing ink from the screen utilized in a silk screen printing process.

Other objects of this invention will become apparent upon a reading of the invention's description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of one embodiment of the apparatus utilized to practice the method of this invention.

FIG. **2** is a detailed longitudinal sectional view of the accumulator tank constituting one of the components of the apparatus shown in FIG. **1.**

FIG. **3** is a fragmentary sectional view taken along line **3—3** of FIG. **1.**

FIG. **4** is a view of the working surface of the cleaning head constituting one of the components of the apparatus of FIG. **1** and as seen along line **4—4** thereof.

FIG. **5** is a schematic diagram illustrating the method of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment illustrated is not intended to be exhaustive or to limit the invention to the precise form disclosed. It is chosen and described in order to explain the principles of the invention and its application and practical use to thereby enable others skilled in the art to best utilize the invention.

A description of the method of this invention can be best understood by referring to the schematic diagram illustrated in FIG. **5.** Reference numeral **10** designates the cleaning head which has planar screen contacting faces **12.** An oval recess **14** is formed in one of the faces **12.** A pair of orifices **16** and **18** are formed within recess **14** at its opposite ends. A tank **20** containing an ink-removing solvent, such as tolulene, is connected to orifice **16** in cleaning head **10** by a conduit **22** which communicates with the solvent. A container, hereinafter referred to as accumulator **24,** having a float **26** therein is provided. Solvent tank **20** is connected to accumulator **24** below float **26** by means of a conduit **28.** A vacuum source **30,** such as a vacuum pump, is connected to accumulator **24** above float **26** by a conduit **32.** Orifice **18** in cleaning head **10** is connected to accumulator **24** below float **26** by a conduit **34.** A check valve **36** is positioned in conduit **28.** Valve **36** allows liquid to flow through conduit **28** from the accumulator to solvent tank **20** only.

With cleaning head **10** positioned with its faces **12** contacting the upper surface of a screen **38** as shown in FIGS. **1** and **3,** a vacuum produced by vacuum source **30** will be developed within the accumulator which at this time is empty of any solvent. As accumulator **24** is being evacuated, a vacuum is also formed through the means of conduit **34** at orifice **18** within recess **14** in the cleaning head. Valve **36** is constructed so as to close upon the formation of a vacuum within the accumulator and thus prevent any solvent from passing from tank **20** into the accumulator through conduit **28.**

The vacuum formed at cleaning head orifice **18** when the cleaning head is positioned against screen **38,** as shown in FIGS. **1** and **3,** causes a vacuum to be formed within recess **14** of the cleaning head above the screen. The vacuum in recess **14** causes solvent to be withdrawn from tank **20** through conduit **22,** out orifice **16** of the cleaning head and across screen **38,** and into orifice **18.** As the solvent is drawn across screen **38,** ink thereon is removed and the solvent and ink pass through conduit **34** into the accumulator below float **26.** The amount of vacuum at orifice **18** is sufficiently

high in relationship to the size of the screen openings and any air drawn therethrough so that a sizeable vacuum is formed within cleaning head recess **14** even though there are openings in the screen. In fact, the air being drawn upwardly through the screen openings helps loosen the ink from the screen. As more solvent and ink enter accumulator **24** through conduit **34,** float **26** will rise until it approaches the top of the accumulator where a valve plug or protrusion **40** closes conduit **32,** as shown in broken lines in FIG. **2,** thereby interrupting the vacuum within the accumulator and terminating the flow of solvent between orifices **16** and **18** of the cleaning head. At this moment valve **36** opens, and either through the weight of the liquid within accumulator **24** combined with the weight of float **26** or by a venting of line **32** to the atmosphere, or by removing the cleaning head **10** from the screen to reduce the vacuum, the liquid solvent and ink therein flow through conduit **28** back into tank **20** where the ink settles to the bottom of the tank. Upon the emptying of accumulator **24,** float **26** returns to the bottom of the accumulator, thus opening conduit **32** and thereby causing the accumulator to again be evacuated when the cleaning head is positioned against screen **38.** Re-evacuation of accumulator **24** causes the solvent to be withdrawn from tank **20** through line **22** and across cleaning head orifices **16** and **18** and screen **38** and back into the accumulator through conduit **34** below float **26.** If line **32** were vented to release the ink and accumulated solvent within the accumulator, obviously this line would have to be closed before the evacuation of accumulator would begin again. This cycle of filling and emptying accumulator **24** would continue until the screen is cleaned of ink.

One embodiment of the apparatus for performing the screen cleaning method above described in shown in detail in FIGS. **1–4.** In FIGS. **1–4** accumulator **24** is shown seated upon the top of solvent tank **20,** overlying opening **42** into the tank. Accumulator **24** includes a cylindrical side wall **44,** an upper end wall **46** and a lower end wall **48.** A pipe **50** extends through accumulator **24** and into tank **20** through its opening **42.** Pipe **50** preferably terminates approximately one-third of the distance from the bottom of tank **20.** Conduit **22** which has one end connected to orifice **16** of cleaning head **10** is connected at its opposite end to the upper end of pipe **50.** Conduit **28** is preferably of rigid tubular form and is connected to lower end wall **48** of the accumulator and projects through tank opening **42** and into the tank. The upper end of conduit **28** is open and communicates at all times with the interior of accumulator **24.** The lower end of conduit **28** has check valve **36** connected thereto. Valve **36** may be of the flapper type which closes over the lower end of conduit **28** when a vacuum is formed within accumulator **24** and which opens when the vacuum within the accumulator is reduced. A filter **52** is preferably incorporated into conduit **28** for the purpose of filtering out ink particles which are entrained within the solvent which is returned to the accumulator. A pipe **54** is connected to upper end wall **46** of the accumulator and extends downwardly therein. Conduit **34** which has one end connected to orifice **18** of cleaning head **10** has its opposite end connected to the upper end of pipe **54.** The lower end **55** of pipe **54** terminates just above lower end wall **48** of the accumulator so as to discharge solvent into the accumulator below float **26.**

An opening **56** is formed in upper end wall **46.** Conduit **32** which is connected at one end to vacuum source **30** has its opposite end placed in communication with accumulator opening **56** either by direct connection therewith or through a valve **58.** Valve **58** is shiftable between a first position in which conduit **32** communicates with opening **56** thereby permitting the evacuation of the accumulator and a second position in which conduit **32** is vented to atmospheric air to terminate the vacuum within the accumulator. The construction of valve **58** may assume any one of a number of well known valve constructions. Float **26** within accumulator **24** may be hollow or formed of a material, such as cork or expanded cellular foam plastic having a density which is less than that of the solvent. Protrusion **40** carried upon the upper surface of float **26** serves as a valve plug for opening **56** in upper end wall **46** of the accumulator. Pipes **50** and **54** extend in a free fit through float **26** so as to prevent rotation of the float within the accumulator and to serve as guides for directing protrusion **40** into opening **56,** as seen in broken lines in FIG. **2,** as the float rises to the top of the accumulator.

Abrasive material, such as spun nylon, may be inserted into the cleaning head recess **14** for the purpose of contacting the upper surface of the screen to loosen the ink thereon as the cleaning head is moved across the screen. During the cleaning process faces **12** of cleaning head **10** contact screen **38** and the cleaning head moves across the screen either by hand or mechanically in circular or back and forth movements. Solvent **66** is drawn from orifice **16** to orifice **18** across the screen due to the vacuum formed within recess **14** in the cleaning head as it contacts screen **38.** To stop the flow of solvent, cleaning head **10** at recess **14** need only be raised from the screen, thus causing the vacuum formed within recess **14** to be terminated. A suitable solvent cut-off valve **62** associated with orifice **16** serves when actuated by the user of cleaning head **10** to stop the flow of solvent within orifice **16** with faces **12** of the cleaning head in contact with screen **38,** thus permitting the vacuum still present within recess **14** to be utilized to suck up any solvent remaining upon the screen at the conclusion of the cleaning operation.

Lower end wall **48** of accumulator **24** is provided with feet **64** which serve to space the lower end wall slightly above opening **42** in the solvent tank. This allows the atmospheric air to enter the interior of tank **20** as the solvent **66** therein is being withdrawn. It is to be understood that the particular design of recess **14** as well as the number and arrangement of orifices **16** and **18** therein may vary, depending upon the application and construction of the cleaning head.

It is to be further understood that the invention is not to be limited to the details above given, but may be modified within the scope of the appended claims.

What we claim is:

1. Apparatus for removing ink from a screen utilized in a silk screen printing process with a solvent, said apparatus comprising a cleaning head having first and second spaced orifices therein, accumulator means for collecting said solvent after removal of said ink from the screen, said accumulator means including a side wall and upper and lower end walls cooperating to define a chamber within the accumulator means, first opening means in said accumulator means through which a vacuum is formed in said chamber, second

opening means in said accumulator means, conduit means extending between said second opening means and said second orifice placing said second opening means and second orifice in flow communication, other conduit means having its one end connected to said first orifice and having its other end adapted for placement in a supply of said solvent, said cleaning head adapted to be placed over said screen and having a vacuum formed between said first and second orifices, and float means within said chamber, said float means being shiftable between the end walls of said accumulator means as said chamber fills with solvent entering from said second opening means, said float means having a draft line representing the depth the float means extends into said solvent when floating thereon, said first opening means being located above said draft line in all operative positions of said float means, said float means carrying means for blocking said first opening means to reduce the vacuum in said chamber as said float means is shifted by said solvent to a selected position within said chamber.

2. The apparatus of claim **1** wherein said first orifice is located below said draft line in all operative positions of said float means.

3. The apparatus of claim **1** and a third opening means in said accumulator means, said third opening means being located in the lower end wall of said accumulator means, conduit means having one of its ends connected to said third opening means and having its other end adapted for placement in a depository means for said solvent, valve means for closing said third conduit means when a vacuum exists in said chamber with said first opening means being not blocked by said float carried means, said third conduit means being open when said first opening means is blocked by said float carried means to allow solvent within said chamber to drain therethrough into said depository means.

4. The apparatus of claim **1** and valve means for blocking flow communication between said second opening means and said second orifice.

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