

March 21, 1967

D. E. BEDUHN

3,310,172

APPARATUS FOR FILTERING LIQUID

Filed Feb. 28, 1963

4 Sheets-Sheet 1

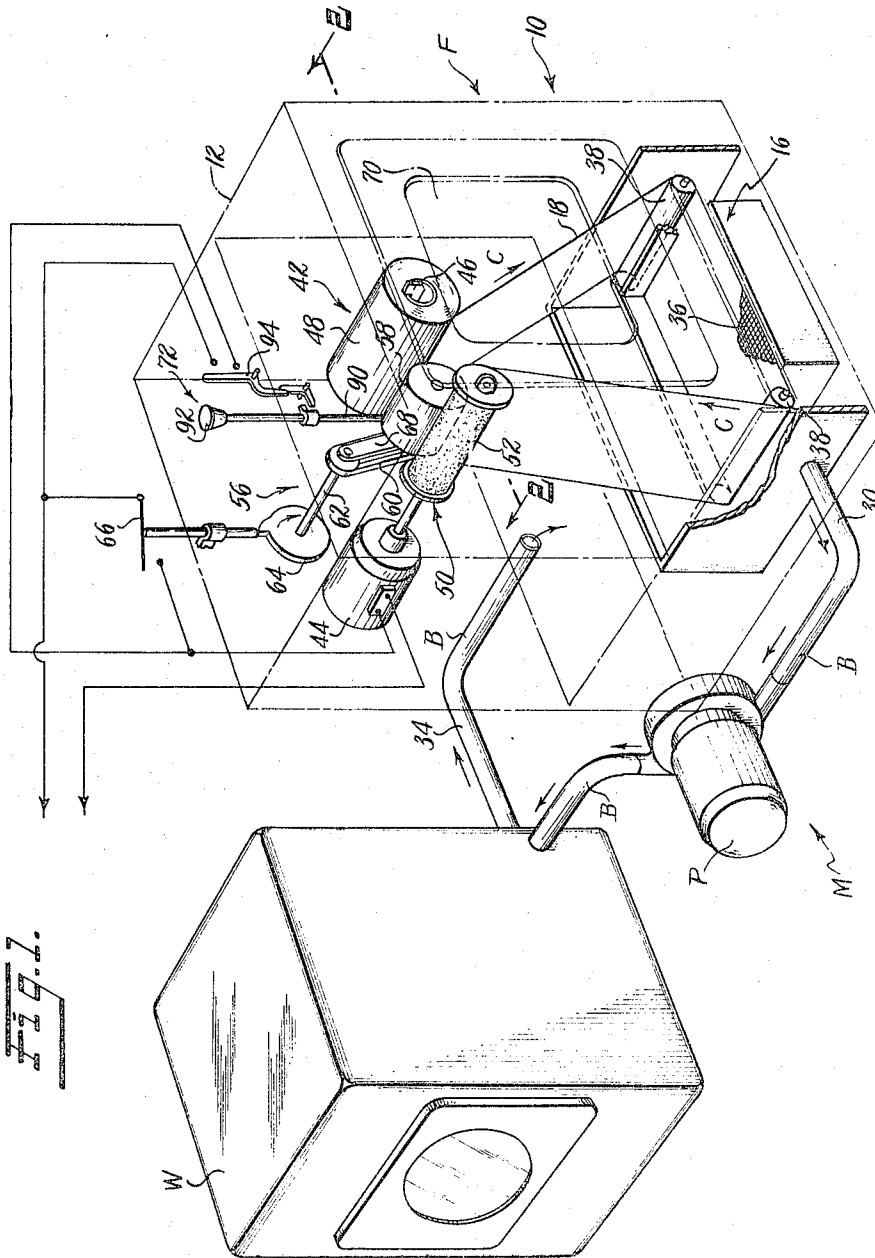


FIG. 1.

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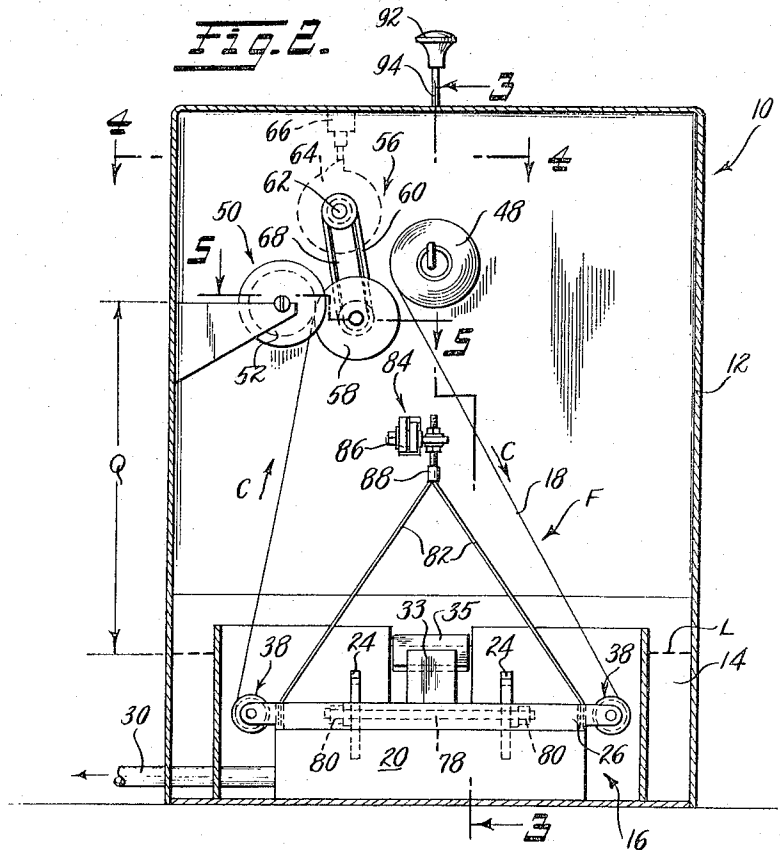
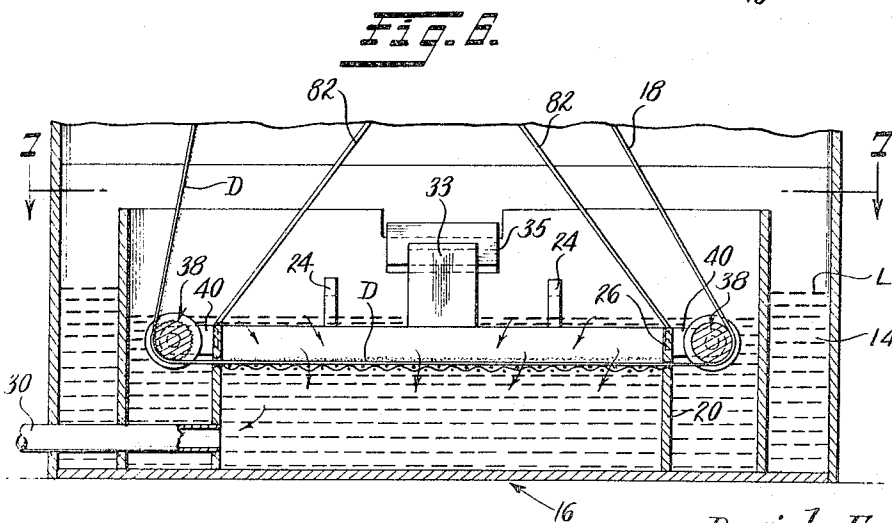
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4 Sheets-Sheet 2



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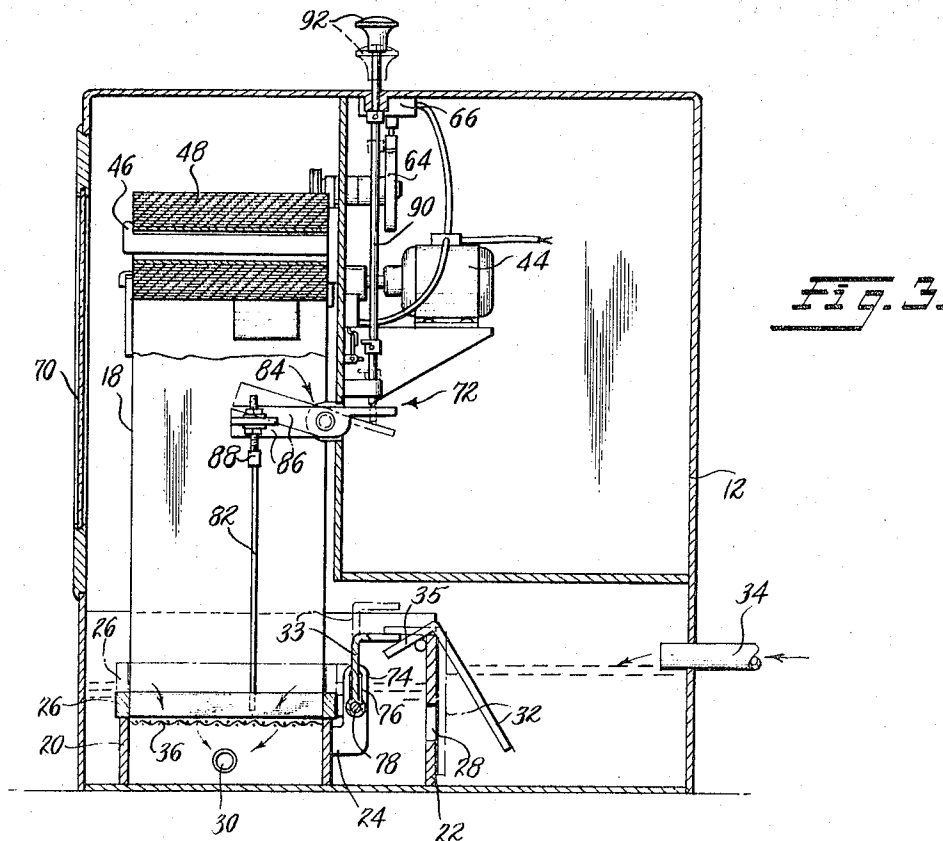
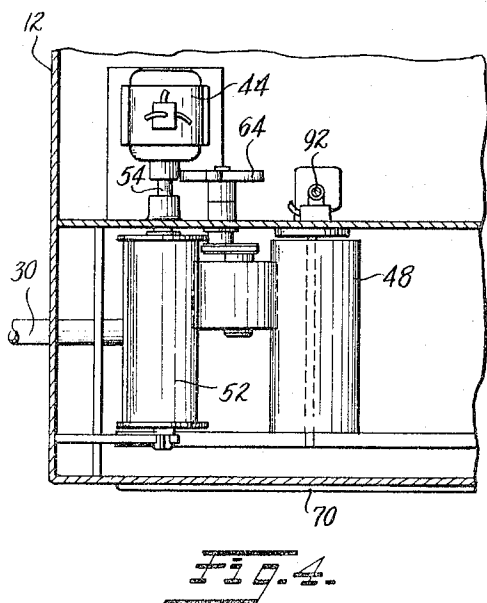
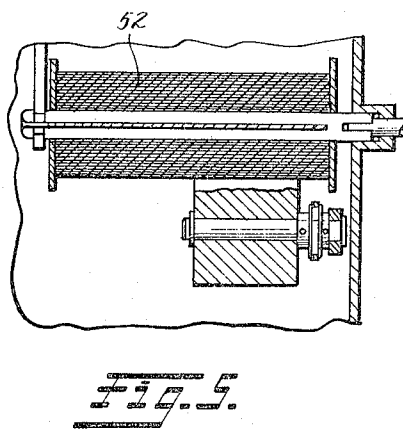
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APPARATUS FOR FILTERING LIQUID

Filed Feb. 28, 1963

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APPARATUS FOR FILTERING LIQUID

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4 Sheets-Sheet 4

Fig. 7.

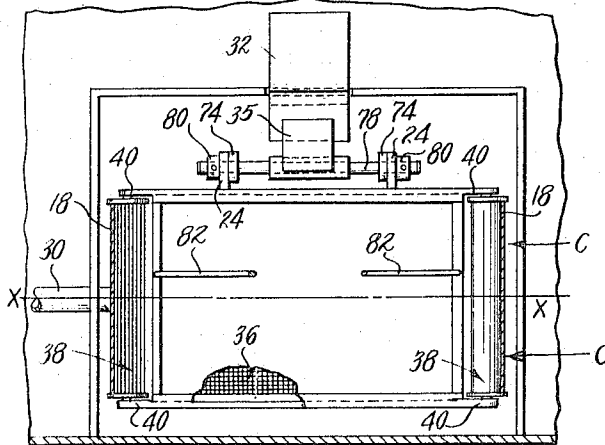


Fig. 8.

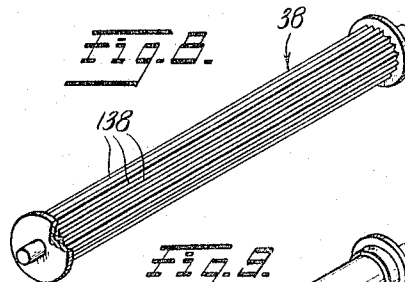


Fig. 9.

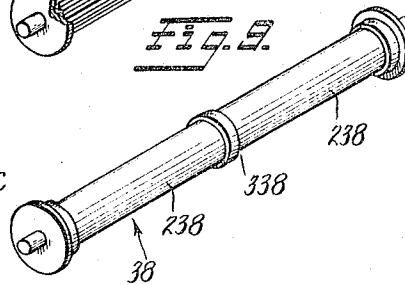
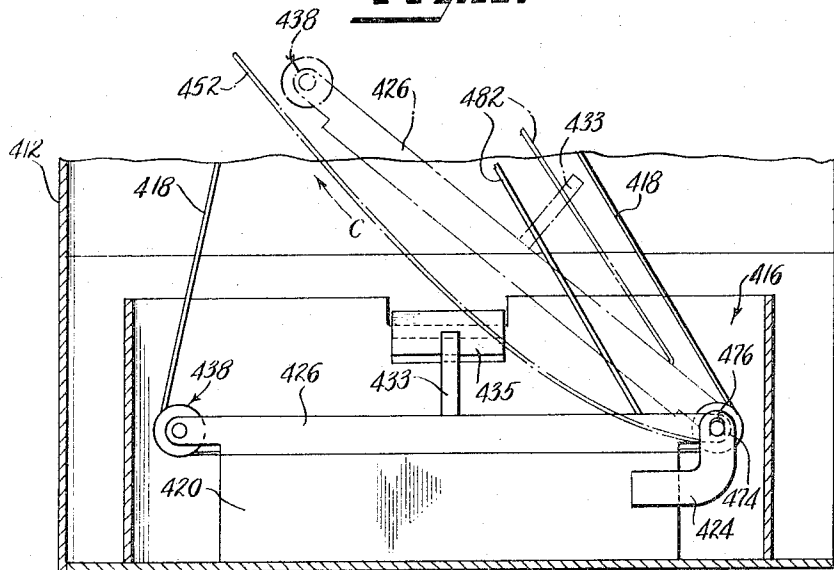


Fig. 10.



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APPARATUS FOR FILTERING LIQUID

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16 Claims. (Cl. 210-143)

This invention relates to apparatus for filtering a liquid, and more particularly, to improved apparatus for filtering undesirable matter, impurities and the like from a liquid solvent being used for cleaning material in a dry cleaning operation or process.

In dry cleaning operations or processes which employ a liquid cleaning solvent there is usually provided a filter, normally of pressure type or cartridge, which functions to filter from the liquid cleaning solvent undesirable matter, such as dirt, lint, impurities or the like, and the liquid cleaning solvent is circulated through the various machinery that is being employed in the dry cleaning process or operation in cleaning the material, such as articles of textile manufacture which may be in the form of garments, wearing apparel or the like, which is repeatedly dipped into and raised from the liquid cleaning solvent during the dry cleaning operation or process.

In the pressure type of filter, as briefly described above, there are many disadvantages, such as filter powders are normally required to be added periodically, in many instances, daily cooking of the filter muck may be required, a great volume of the liquid cleaning solvent may be wasted, back-washing is necessary which requires additional piping and plumbing; while the cartridge filters require frequent exchanges of the filter cartridge, messy filter cartridges must be handled in order to place and replace the cartridges in the system, and such replacements of the filter cartridges are often frequent, time-consuming and costly, the cartridges are limited in the size of filter surface and filtering capacity, and dry cleaning machinery which employs a filtering arrangement such as filter cartridges is normally and usually bulky, space-consuming and expensive.

Accordingly, it is an object of this invention to provide apparatus for filtering liquid cleaning solvent which is employed to clean material in a dry cleaning process or operation which eliminates at least one and possibly more of the disadvantages as stated above.

It is also an object of this invention to provide an improved apparatus for filtering a liquid.

It is a further object of this invention to provide apparatus for filtering a liquid which employs an improved arrangement for providing a supply of unused filter medium for filtering the liquid and which defines an area whereat used portions of the filter medium may be collected, stowed and received after being employed to filter the liquid.

It is also a further object of this invention to provide apparatus for filtering a liquid solvent with an improved arrangement for providing a supply of unused filter medium in the form of a continuous roll of sheet-like fibrous-pulp, such as paper, with the arrangement further defining an area whereat the used portions of the filter medium may be collected, stowed or otherwise deposited after filtering the liquid.

Still a further object of this invention is to provide apparatus for filtering a liquid solvent with an improved arrangement for providing a supply of unused filter medium, preferably in the form of a roll of a fibrous-pulp such as paper, having controlled drive means for periodically advancing the filter medium from the supply thereof to an area whereat the used portions thereof may be stowed, collected or otherwise deposited after filtering the liquid.

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Another object of this invention is to provide apparatus for filtering a liquid with improved structure for positioning a filter medium in submerged relationship relative to the liquid.

It is also another object of this invention to provide apparatus for filtering a liquid solvent with improved structure for positioning a portion of a filter medium in submerged relationship relative to the liquid with the structure having pivotally mounted portions for receiving the portion of the filter medium therebetween to maintain the portion of the filter medium in the submerged position and anti-friction elements for enabling the filter medium to be guided during movement thereof along a given course to position another portion thereof in the submerged relationship relative to the liquid.

An additional object of this invention is to provide apparatus for filtering a liquid with an improved control for enabling a filter medium to be advanced along a given course from a fresh supply of the filter medium to a position whereat the filter medium filters the liquid and then to a collecting area where the used portions of the filter medium may be stowed.

It is also an additional object of this invention to provide apparatus for filtering a liquid solvent employed for cleaning material in a dry cleaning process which enables a smaller cost per load for cleaning the material than may be had by more conventional types of processes now being employed.

Yet it is an additional object of this invention to provide improved apparatus for filtering a liquid solvent employed in combination with machinery for cleaning material in a dry cleaning process or operation which requires the recycling of the liquid solvent through the machinery to enable maximum filtering efficiency to be had during many consecutive cleaning cycles of the machinery in cleaning the material by re-cycling the liquid solvent through the machinery during the dry cleaning process.

It is also a further additional object of this invention to provide improved apparatus for filtering a liquid which is durable and reliable in use, inexpensive to manufacture, and economical and efficient in operation.

In order to overcome the disadvantages and acquire the highly desirable objects as stated above, the improved apparatus for filtering a liquid in accordance with the present invention comprises the provision of a container wherein there may be confined a quantity of the liquid which is to be filtered with the container maintaining the liquid at a desired level. An arrangement is provided, preferably at a location within the container, which is above the level of the liquid, whereat there is positioned a supply of unused filter medium, which is preferably in the form of a continuous sheet or roll of fibrous pulp such as paper, arranged to be unrolled in response to a driven reel or spool which defines an area whereat the used portions of the filter medium may be collected, stowed or deposited after being used to filter the liquid. Structure is employed and disposed intermediate the supply and collecting areas of the filter medium for positioning and maintaining a portion of the filter medium in submerged relationship relative to the liquid level in the container. Suitable controlling, in the form of switch elements actuated by cam members, linkages, measuring devices, etc., are provided for enabling and controlling the periodic advancement of the filter medium along a given course which pass from the supply area of the filter medium through the structure and then to the collecting area of the arrangement. The apparatus is intended to be used in combination with various machinery and suitable means may be provided for urging the liquid to flow through the filter medium at the submerged position and then through appropriate conduits in a manner which will

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enable the filtered liquid to be re-cycled and employed to perform a function as desired.

Other objects and important features of the subject inventive concept will be apparent from a study of the remaining descriptive portion of the specification which, when taken with the drawing, shows, describes, discloses and illustrates the preferred embodiments or modifications of the improved apparatus for filtering a liquid in what is now considered to be the best mode of practicing the principles thereof. Still other embodiments or modifications may be suggested to those having the benefit of the teachings herein and such other embodiments or modifications are intended to be reserved especially as they fall within the scope and spirit of the subjoined claims.

In the drawing:

FIGURE 1 is a diagrammatic view with portions thereof broken away, of one possible embodiment of machinery which as illustrated is employed in a system, process or operation for dry cleaning material wherein the novel apparatus and improved method of filtering fluid in accordance with this invention may be employed;

FIGURE 2 is a side elevational schematic view of the novel apparatus employing the improved method for filtering a liquid taken along the line 2—2 of FIGURE 1, looking in the direction of the arrows;

FIGURE 3 is a side elevational view of the novel apparatus employing the improved method for filtering a fluid, taken along the line 3—3 of FIGURE 2 and looking in the direction of the arrows;

FIGURE 4 is a partial plan view of an arrangement for providing a supply of unused filter medium for the improved apparatus and novel method of filtering a fluid, taken along the line 4—4 of FIGURE 2 looking in the direction of the arrows;

FIGURE 5 is a partial plan view of a control for enabling filter medium to be advanced along a given course of the novel apparatus and the improved method for filtering fluid taken along the line 5—5 of FIGURE 2 and looking in the direction of the arrows;

FIGURE 6 is an enlarged side elevational view of the lower portion of FIGURE 2 and illustrating in more detail structure for positioning a portion of filter medium in an operative filtering position;

FIGURE 7 is a plan view on a reduced scale of the structure illustrated in FIGURE 6, taken along the line 7—7 and looking in the direction of the arrows;

FIGURE 8 is an isometric view of one possible modification for an anti-friction element of the structure illustrated in FIGURES 6 and 7;

FIGURE 9 is an isometric view of another modification of an anti-friction element similar to the element illustrated in FIGURE 8, and

FIGURE 10 is a modification of the structure for positioning the portion of the filter medium and is similar to the structure illustrated in FIGURE 6.

Attention is now directed to FIGURE 1 of the drawing wherein there is shown machinery M which for the purpose of illustration only may be considered as being employed in a dry cleaning system, operation or process in which a liquid cleaning solvent 14 is recycled through conduit means B by means P in order to properly clean textile material as illustrated, such as garments or the like, in a washer W with the machinery M having a filtering area F for filtering from the solvent 14 undesirable material D such as dirt, lint, impurities or the like.

As shown in more detail in FIGURES 2 through 7 of the drawing, the filtering arrangement F comprises apparatus 10 which defines a container or tank 12 for confining a quantity of the liquid cleaning solvent 14, such as perchlorethylene or any other suitable solvent solution, at a desired level L for use in cleaning the articles of textile material such as the garments which may be placed in the washer W during a dry cleaning process or operation.

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Located in a zone of use in the lower portion adjacent the bottom of the container 12 below the solvent level L and completely submerged therein, there is provided structure 16 for supporting a portion of an elongate sheet-like filter medium 18 which may be preferably formed of a fibrous-pulp material such as paper or the like of indefinite length.

The structure 16 as more fully illustrated in FIGURES 2, 3, 6 and 7 of the drawing comprises a base portion 20 defined by spaced apart upstanding wall portions to which there is pivotally secured by suitable bracket-like elements 24 a top or upper portion 26 which is also defined by spaced apart upstanding wall portions. The pivotal movement of the top portion 26 relative to the base portion 20 of the structure 16 is illustrated by dotted lines in FIGURE 3 of the drawing with the motion that is imparted to the top portion 26 having a swivel action in a manner which will be more fully described and disclosed hereinafter.

The base 20 and the top 26 members or portions of the structure 16 are each open intermediate the respective wall portions thereof to enable the solvent 14 to pass therethrough along a flow path illustrated by arrows in FIGURES 3 and 6 of the drawing from within the confines of the container 12 to discharge outlet conduit means 30 which is in communication with the means P which is preferably a conventional type of pump device for urging filtered clean solvent to flow from the apparatus 10 to the washer W or some other similar machinery in the dry cleaning system, operation or process from which the dirty used unfiltered solvent will be returned to the confines of the container 12 of the apparatus 10 through suitable return inlet conduit means 34.

A foraminous screen-like member 36 is carried by the base portion 20 of the structure 16 with the screen-like member 36 being disposed to support a portion of the filter medium 18 during the step of filtering the solvent 14 in the container 12 with the portion of the filter medium 18 fully covering the openings through the base 20 and the top 26 portions of the structure 16.

A pair of roller-like anti-friction elements 38 are disposed adjacent opposed end portions of the top portion 26 of the structure 16 with the filter medium 18 passing thereabout to enable the filter medium 18 to be advanced along a course C as indicated by the arrows in FIGURES 1, 2 and 3 of the drawing, in a manner which will be described and disclosed in more detail hereinafter.

The roller-like anti-friction guide elements 38 are each journaled to bracket-like members 40 that project from the top portion 26 of the structure 16 and not only define a rotatable support for the respective elements 38, but also define guide means for guiding the filter medium 18 along the course C and attention is directed to FIGURE 7 of the drawing wherein it is to be noted that the respective members 40, in each instance, are laterally spaced one to the other relative to the course C along which the filter medium 18 travels.

As shown more clearly in FIGURE 6 of the drawing, the undesirable matter D such as dirt, lint, impurities or the like, is filtered from the liquid cleaning solvent 14 and remain on the upper surface of the filter medium 18 and on advancement of the filter medium 18 along the given course C the undesirable matter D will come into engagement with the roller-like element 38 which is to the downstream side of the given course C. In order to have a minimum area of engagement between the undesirable material D and the surface of the downstream roller-like element 38, the surface of the roller-like element is preferably recessed or relieved and one possible modification of the surface is illustrated in FIGURE 8 of the drawing wherein the surface is recessed or relieved by a plurality of peripherally disposed grooves 138 which extend generally longitudinally relative to the roller-like element 38, while in FIGURE 9 of the drawing a plurality of laterally spaced circumferentially extending

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grooves 238 are provided which are separated by a land portion 338.

Also, completely surrounding the structure 16, there is provided a device 22 which comprises baffle, drum or weir-like structure which cooperates with the container 12 to maintain the fluid-cleaning solvent 14 at the desired level L and which also prevents the fluid cleaning solvent 14 from draining through the structure 16 while the filter medium 18 is being advanced along the given course C. The weir-like structural device 22 is defined by an upstanding wall portion that is provided with an opening 28 which is controlled by conventional type flap valving 32 best illustrated in FIGURE 3 of the drawing. When the apparatus 10 is functioning to filter the fluid cleaning solvent 14 the upper portion 26 of the structure 16 is seated on the base portion 20 thereof. There is provided an elongate part 33 which is carried by and projects from the upper portion 26 of the structure 16 which when the upper portion 26 is in engagement, a part 35 of the flap valving 32 with the flap valving 32 being in an open position for enabling the fluid cleaning solvent 14 to flow through the opening 28 in the upstanding portion of the weir-like structural device 22. As more clearly illustrated in FIGURE 3 of the drawing, on movement of the upper portion 26 of the structure 16 from the seated engagement on the lower portion 20 thereof, as illustrated in solid lines, to the upwardly spaced position as illustrated in dotted lines in FIGURE 3, the part 33 is disengaged from the part 35 to enable the flap valving 32 to close the opening 28 and prevent the fluid cleaning solvent 14 from flowing in the path through the structure 16 while the filter medium 18 is being advanced along the given course C.

An arrangement 42 is provided adjacent the upper portion of the container 12 of the apparatus 10 for enabling a fresh clean supply of the filter medium 18 to be available for use as well as assuring that the filter medium 18 when used will be stored so that the filter medium 18 will be easily and readily placed or replaced with the apparatus 10 being loaded or unloaded as required for use.

The arrangement 42 comprises a suitable bracket-like suspension 46, for receiving and rotatably supporting a fresh clean supply of unused filter medium 48 which is preferably in the form of a roll and which further defines an area wherein there is positioned a spool, reel or other similar winding device 50 for receiving, stowing or otherwise collecting dirty filter medium 52 having the undesirable material D thereon after the filter medium 18 has been employed to filter and clean the solvent 14.

The spool 50 may be driven through a conventional type of drive means 54 by a motor 44 in a manner which will cause the roll of clean filter medium 48 to be advanced as desired along the given course C.

A device 56 for controlling the advancement of the filter medium 18 along the course C is provided which comprises a measuring member 58 in the form of a roller for measuring the extent of travel which the filter medium 18 will have along the course C with the member 58 being driven by contact with the dirty used filter medium 52 on the spool 50 and provided with a circumference that is substantially equal to the distance that the filter medium 18 should be advanced in order to completely cover the openings in the base 20 and the top 26 portions of the structure 16 with fresh unused clean filter medium from the supply 48 after each cleaning cycle of the dry cleaning system, process, operation or at any other interval which may be desired.

The measuring member 58 is drivingly connected, in the preferred embodiment, through a chain-like drive 60 for controlling the operation of the motor 44 and as illustrated the measuring member 58 rotates a shaft 62 which in turn actuates a cam-like member 64 to open and close a switch element 66 which in turn controls the operation of the motor 44 in response to the measuring member 58 after the measuring member 58 makes one

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complete revolution. As illustrated in FIGURES 4 and 5 of the drawing the measuring member 58 is swivelly or movably suspended from the shaft 62 through suitable bracket-like structure 68 to enable the measuring member 58 to be in engagement with the dirty used filter medium 52 on the spool 50 and to be maintained in such engagement as the filter medium 18 is wound from the supply 48 to the storage thereof on the spool 50. If desired, a bias, not illustrated, may be provided for urging the bracket-like structure 68 toward the dirty used filter medium 52 on the spool 50 in order to maintain the measuring member 58 in driven engagement therewith.

Certain structural details of the apparatus 10 are now to be more fully described and disclosed. As illustrated, the preferred embodiment of the inventive concept provides that the container 12 is of substantially rectangular configuration, closed on all four sides except for the discharge conduit means 30 and inlet conduit means 34 as well as being closed along the bottom portion thereof.

The preferred embodiment of the apparatus 10 may also be provided with a glass door 70 which is hinged to the container 12 and defines a side wall portion thereof and which enables an operator to view the interior of the apparatus 10 during the dry cleaning process or operation. By providing the apparatus 10 with the door 70 easy access is available to the interior of the container 12 from the side thereof to facilitate in the placing, replacing, loading, reloading of the filter medium 18 since the supply of fresh clean unused filter medium 48 and the spool 50 containing the used dirty filter medium 52 is disposed adjacent the upper portion of the container 12. Further, by having access through the side of the container 12 by reason of the glass door 70 the operator is permitted to position the portion of the filter medium 18 about the anti-friction elements 38 and screen-like member 36 between the base 20 and top 26 portions of the structure 16 when the top portion 26 has been pivoted or swivelled to an extended or upwardly raised position.

The upper portion of the container 12 of the apparatus 10 may be open for permitting easy and ready access to the structural features of the arrangement 42, such as the fresh clean unused supply of filter medium 48, the spool 50 having the dirty used filter medium 52 wound thereon, the drive means 54, the device 56, the measuring member 58, the chain-like drive 60, the shaft 62, the cam-like member 64, the switch element 66, the suspension members 68, etc.

Further, it has been found highly desirable that the structure 16 be also of substantial rectangular configuration. However, other shapes may be employed so long as the structure 16 is capable of supporting the portion of the filter medium 18 so that the means P may urge the dirty solvent to flow in the flow path through the filter medium 18 to the dry cleaning machinery W.

It is also to be noted that the rotational axes of the supply of fresh clean filter medium 48, the anti-friction elements 38, the measuring member 58 and the spool 50 are disposed in substantially parallel relationship relative to each other.

Further, it is highly desirable that the rotational axis of the spool 50 be spaced from the level L of the solvent 14 which is confined in the container 12 a predetermined distance Q as shown in FIGURE 2 of the drawing, which will permit the damp or wet dirty used filter medium 52 on leaving the structure 16 to dry before being wound onto the spool 50.

A control 72 is provided for moving the top portion 26 of the structure 16 relative to the base portion 20 thereof for enabling the top portion 26 to be substantially fully disposed in upwardly spaced relationship relative to the base portion 20 throughout the full extent of the structure 16 to enable the portion of the filter medium 18 to be advanced along the course C. The control 72 comprises an enlarged part 74 on each of the bracket-like elements 24 which are secured to and project from the base portion

20 of the structure 16 with each of the parts 74 being provided with oval shaped elongate openings 76 in which the top portion 26 is pivotally mounted through pivotal mounting element 78 which has a cross-sectional area substantially smaller than the area defined by the respective openings 76. Suitable securement 80, such as cotter pins, washers or the like, may be employed for maintaining the pivot element 78 within the confines of the openings 76.

Secured to the top portion 26 of the structure 16 is an elongate member 82 preferably in the form of a bodily flexible cable or similar suitable means, with the location of the securement of the member 82 to the top portion 26 being laterally offset from the longitudinally extending centerline X—X shown in FIGURE 7 of the drawing of the top portion 26 toward the pivotal mounting of the top portion 26 to the base portion 20 of the structure 16. In other words, the securement of the member 82 to the top portion 26 is at a location which is intermediate the longitudinally extending centerline X—X of the course C of travel of the filter medium 18 and the pivotal mounting of the top portion 26 to the base portion 20 of the structure 16. Accordingly, a movement of the member 82 upwardly the side portion of the top portion 26 of the structure 16 will be lifted or urged upwardly before the other or outer side portion thereof will be lifted until the pivot element 78 of the control 72 engages the upper portion of the oval-shaped elongate openings 76 at which time the upward movement of the hinged side portion of the top portion 26 will be stopped, the lost motion thereof will cease and the outer side portion of the top portion 26 may then be urged upwardly to a position as illustrated by dotted lines in FIGURE 3 of the drawing whereat the top portion 26 is upwardly spaced from the base portion 20 throughout the full extent of the structure 16 to enable the filter medium 18 to be advanced along the course C.

In order to urge the member 82 in an upward direction the member 82 is connected to a linkage 84 which comprises a lever-like part 86 that is pivotally supported within the confines of the container 12 for pivotal movement about an axis which is substantially parallel to the pivotal axis defined by the pivot element 78. In connecting the member 82 to the lever-like part 86, if desirable, an adjustment 88 may be provided for adjusting the effect of the member 82 on urging the top portion 26 of the structure 16 in the pivotal movements as described above. The member 82 is secured to the lever-like part 86 adjacent one end portion thereof and an actuator 90 preferably in the form of a bodily rigid rod-like member is secured to the other end portion of the lever-like part 86 with the pivotal mounting of the part 86 to the container 12 being intermediate the connections of the member 82 and the actuator 90. The actuator 90 extends generally upwardly from the connection thereof to the part 86 and projects beyond the confines of the container 12 whereat it terminates in a knob-like part 92 and is readily available for use by the operator of the apparatus 10 through an automatic remote control 94 illustrated schematically in FIGURE 1 of the drawing.

On movement of the knob-like part 92 generally downwardly the actuator 90 pivots the part 86 in a manner to cause upward movement to the member 82 which will in turn raise the top portion 26 of the structure 16 and enable the portion of filter medium 18 to be positioned and advanced along the course C.

In operation, the roll of fresh clean unused filter medium 48 is loaded or placed on the bracket-like suspension 46 and the spool 50 having the dirty used filter medium 52 wound thereon is removed from the apparatus 10 by merely opening the glass door 70 and raising the top portion 26 of the structure 16 relative to the base portion 20 thereof to enable the portion of the filter medium 18 to be placed between the base 20 and the top 26 portions of the structure 16 in a position which completely

covers the openings therethrough with the free end portion of the filter medium 18 being wound onto the spool 50. The top portion 26 of the structure 16 is then returned into seated engagement with the base portion 20 thereof so that the portion of the filter medium will be effectively supported by the screen-like member 36, the glass door 70 closed and the cleaning machinery W actuated to commence the cleaning operation or process. The means P is then started and the force created thereby acts to cause the portion of the filter medium 18 to be urged against the screen-like member 36 and further causes the dirty solvent 14 to pass along the flow path and be filtered by the portion of the filter medium 18 so that the cleaned filtered solvent flows through the discharge outlet conduit means 30 to the means P and then to the machinery W whereat the solvent processes the garments or material to be cleaned, as the case may be, and is then returned to the container 12 through the return inlet conduit means 34. The forces created on actuation of the means P are positive in action to maintain and hold the portion of the filter medium 18 against the screen-like member 36 and the adjacent wall portions of the structure 16 in a manner to prevent foreign material from passing through the flow path of the solvent 14 during the cleaning operation of the machinery W.

When desired, or as needed, which is generally at the end of an operating cycle of the dry cleaning process or operation, the knob-like part 92 is depressed or moved on actuation of the control 94 which in turn spaces the top portion 26 from the base portion 20 of the structure 16 and the motor 44 is actuated which drives the spool 50 to advance the filter medium 18 along the course C with the measuring member 58 being rotated through engagement with the supply of fresh clean unused filter medium 48 which in turn through the drive 60 will rotate the cam-like member 64 and at the end of one rotation of the measuring member 58 the cam-like member 64 will cut off the motor 44 through the switch element 66 at which time the openings in the base 20 and top 26 portions of the structure 16 are completely covered by a new portion of fresh clean unused filter medium 48. The knob-like part 92 is then raised, released or moved by reason of the control 94 to re-position the top portion 26 in seated engagement with the base portion 20 of the structure 16 and the apparatus 10 is then ready for use in another cleaning cycle.

As previously mentioned the undesirable material D which is carried by the upper surface of the dirty used filter medium 52 comes into contact with the anti-friction element 38 to the downstream side of the course C along which the filter medium 18 travels and two possible modifications of the downstream anti-friction device 38 have been described and disclosed above and illustrated in FIGURES 8 and 9 of the drawing.

However, a further modification of the structure 16 has, in actual practice, been found to be highly desirable in fully eliminating any contact between the dirty used filter medium 52 and the downstream roller-like element 38, and attention is now directed to FIGURE 10 of the drawings wherein such desired modification of the structure 16 is illustrated with reference characters of the 400 series being employed to designate those parts thereof which are similar to the parts previously described and disclosed.

Basically, the modification of the structure 16 illustrated in FIGURE 10, differs from the previously described and disclosed structure by having a top or upper portion 426 pivotally mounted to a lower or base portion 420 along an end portion thereof rather than a side portion as in the previously described and disclosed structure. By pivotally mounting the upper portion 426 to the lower portion 420, it is possible that the upper portion 426 may be pivotally moved to a position indicated by dotted lines in FIGURE 10 whereat the downstream anti-friction element 438 is disposed beyond and in spaced relationship

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to the catenary configuration which will occur in the dirty used filter medium 452 as it passes along the given course C in advancing the filter medium 418 therealong. Further, the bodily flexible cable or elongate member 482 is secured to the upper portion 426 of the structure 16 at a location thereon which is near the pivotal mounting thereof to the lower portion 420 so that the initial movement will be similar to the movement previously described and disclosed to assure that the upper portion 426 will be spaced throughout the full extent thereof from the lower portion 420.

While the invention has been described, disclosed, illustrated and shown in terms of several embodiments or modifications which it has assumed in practice, the scope of the invention should not be deemed to be limited by the precise embodiments or modifications herein described, disclosed shown and illustrated such other embodiments or modifications being intended to be reserved especially as they fall within the scope of the claims here appended.

I claim as my invention:

1. Apparatus for filtering a liquid, said apparatus comprising

a container for maintaining a quantity of such liquid at a desired level,

means for supporting a supply of filter medium of indefinite length,

means for advancing the filter medium from the supply support through a zone of use,

means for collecting the filter medium following the use thereof,

structure for positioning a portion of the filter medium in submerged relationship to such liquid level,

said structure comprising base and top portions having aligned openings therethrough with the position of the filter medium being disposed intermediate the base and the top portions and covering the openings therethrough,

a control for enabling the filter medium to be advanced along a given course from the supply thereof to the position at the structure and then to the collecting means,

said control comprising

bracket-like elements having elongate openings therein for pivotally mounting the top portion of the structure to the base portion thereof,

an elongate member secured to the top portion of the structure at a location thereon which is intermediate the longitudinally extending center-line thereof and the bracket-like elements,

a linkage comprising

a lever-like part having the member secured thereto adjacent one end portion thereof and an actuator secured adjacent the other end portion,

said lever-like part being pivotally mounted intermediate the end portions thereof to effect movement to the member in a direction that is opposed to the direction of movement of the actuator, and

means for urging such liquid to flow in a path through the portion of the filter medium which is positioned by the structure.

2. An apparatus for filtering a liquid solvent comprising:

a container for maintaining liquid at a level;

a support for a supply of filter medium of indefinite length;

drive means to advance the filter medium from the support through a zone of use in the container;

takeup means for the filter medium following use thereof;

a top member in the zone of use in the container, said top member having a liquid passage therethrough;

a plurality of anti-friction guides on the top member

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for guiding the filter medium from the support under the top member and for guiding the filter medium following use thereof from the zone of use to the takeup means;

a plurality of brackets having elongate openings therein disposed in the container for pivotally supporting the top member;

means pivotally connecting the top member adjacent the edge portion thereof in the elongate openings in the brackets;

a base member in the zone of use in the container, said base member underlying the top member and having a liquid passage therethrough;

a foraminous member covering the passage in the base member for supporting the filter medium during use;

means secured to the top member between the pivotal connection and the longitudinally extending center line in the course of travel of the filter medium under the top member for moving the top member from a first position adjacent the base member wherein the passages of the top and the base members are aligned and the top member temporarily fixes a portion of the filter medium over the foraminous member covering the base member passage, to a second position whereat the top member is spaced above the base member to permit the filter medium to be advanced to the takeup means and to guide the filter medium as it is being advanced; and

means for urging liquid to flow in a path through the passage of the top member, the filter medium, the foraminous member and the passage of the base member when the top member is in the first position.

3. The apparatus of claim 2 wherein the means for moving the top member comprises:

an elongate member secured to the top member;

a lever connected proximate one end portion thereof to the elongate member;

means pivotally mounting the lever intermediate the end portions thereof to the container; and

an actuator engaging the other end portion of the lever for depressing the other end portion thereof to raise the one end portion of the lever to move the top member from the first position to the second position.

4. The apparatus as set forth in claim 3 further comprising:

circuit means for energizing the drive means;

a switch in the circuit means for closing the circuit means to energize the drive means; and

means on the actuator for closing the switch when the other end portion of the lever is depressed to advance the filter medium while the top member is in the second position.

5. The apparatus of claim 4 wherein:

the switch is a momentary switch for momentarily closing the circuit means;

and further comprising:

measuring means for drivingly engaging the filter medium for measuring a given length of travel of the filter medium; and

a holding switch operatively engaged with the measuring means for opening the circuit means when a given length of the filter medium has travelled between the top and the base members.

6. The apparatus as set forth in claim 2 further comprising:

a weir comprising upstanding sides surrounding the top and the base members in the container defining the zone of use with a side thereof having a valve aperture therein for communicating with the container;

a valve for closing the valve aperture;

a valve operator connected to the valve; and

means interconnecting the top member and the valve operator for enabling the valve to be closed when

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the top member is moved from the first position and to prevent entry of liquid from the container to the weir when the top member is in the second position.

7. An apparatus for filtering a liquid solvent comprising:
- a container for maintaining the liquid solvent at a level therein;
 - a support for a supply of filter medium of indefinite length;
 - drive means for advancing the filter medium from the support through a zone of use in the container;
 - takeup means for the filter medium following the use thereof;
 - a weir in the container formed of upstanding sides defining the zone of use with at least one side thereof having a valve aperture therein for communicating with the container below the liquid level;
 - a valve for closing the valve aperture;
 - a valve operator connected to the valve;
 - a base member in the weir having a liquid passage therethrough;
 - a foraminous member covering the liquid passage of the base member for supporting the filter medium during use thereof;
 - a top member disposed in the weir above the base member having a liquid passage therethrough;
 - a plurality of anti-friction guides on the top member for guiding the filter medium from the support under the top member and guiding the filter medium following use thereof to the takeup means;
 - means for moving the top member from a first position adjacent the base member whereat a portion of the filter medium is temporarily fixed between the top and the base members and whereat the passages in the top of the base members are aligned, to a second position spaced from the base member for permitting movement of the filter medium between the top and the base members and for guiding the movement of the filter medium therebetween;
 - means interconnecting the top member and the valve operator for closing the valve when the top member is moved from the first position to prevent entry of the liquid from the container to the weir when the top member is in the second position to permit advancement of the filter medium; and
 - means for urging the liquid to flow in a path through the passage in the top member, the filter medium, the foraminous member and the passage in the base member when the top member is in the first position.
8. The apparatus as set forth in claim 7 further comprising:
- circuit means for energizing the drive means to advance the filter medium through the zone of use;
 - a momentary closing switch operatively engaged with the top member moving means for momentarily closing the circuit means when the top member is moved from the first position;
 - a measuring member for driving engagement with the filter medium for measuring the travel of a predetermined length of filter medium; and
 - a holding switch in the circuit in operative engagement with the measuring means for maintaining the drive means in energized condition until a predetermined length of the filter medium has been advanced and opening the circuit to de-energize the drive means when said predetermined length of filter medium has been advanced.
9. The apparatus as set forth in claim 7 wherein: the takeup means is a takeup reel; and the drive means is connected to the takeup reel to advance the filter medium; and further comprising:
- a measuring member having a peripheral portion thereof for drivingly engaging the filter medium with the peripheral portion being

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of substantially the same length as the cross-sectional dimension of the smaller of the passages through the top and the base members when measured in the direction of travel of the filter medium between the top and the base members;

- a cam secured to the container;
 - means mounting the cam for movement;
 - a drive connection interconnecting the measuring member and the cam for driving the cam as the measuring member is driven by the filter medium;
 - circuit means for energizing the drive means;
 - a first switch in the circuit means disposed in operative relationship relative to the cam for energizing the drive means during a major portion of the cam cycle and de-energizing the drive means during a minor portion of the cam cycle; and
 - a momentarily closing switch in the circuit means disposed in operative relationship relative to the means for moving the top member for momentarily energizing the drive means when the top member is moved from the first position;
- whereby the drive means is maintained in energized condition by the first switch until a length of filter medium substantially of the length of the cross-sectional dimension has passed between the top and the base members.
10. The apparatus as set forth in claim 7 wherein the means for moving the top member comprises:
- an elongate member secured to the top member;
 - a lever connected adjacent one end portion thereof to the elongate member;
 - means pivotally mounting the lever intermediate the end portions thereof to the container; and
 - an actuator engaging the other end portion of the lever for depressing the other end portion thereof to raise the one end portion of the lever to move the top member from the first position to the second position.
11. The apparatus as set forth in claim 10 further comprising:
- circuit means for energizing the drive means;
 - a switch in the circuit means for closing the circuit means to energize the drive means;
 - means on the actuator for closing the switch when the other end portion of the lever is depressed to advance the filter medium while the top member is in the second position.
12. The apparatus as set forth in claim 11 wherein: the switch is a momentary switch for momentarily closing the circuit; and further including:
- measuring means for drivingly engaging the filter medium for measuring a given length of travel thereof;
 - a holding switch in the circuit means operatively engaging the measuring means for opening the circuit when the given length of filter medium has travelled between the top and the base members.
13. A filtering apparatus comprising:
- a container for maintaining liquid at a level;
 - a support for a supply of filter medium of indefinite length;
 - a takeup reel for the filter medium following use thereof;
 - means for driving the takeup reel for advancing the filter medium;
 - a base member having a liquid passage therethrough disposed in the container;
 - a foraminous member covering the liquid passage of

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the base member for supporting the filter medium during use thereof;

a top member having a liquid passage therethrough disposed in the container above the base member;

a plurality of anti-friction guides on the top member for guiding the filter medium from the support under the top member and for guiding the filter medium following use thereof to the takeup reel;

means mounting the top member for pivotal and vertical movement in the container;

means for moving the top member from a first position adjacent the base member whereat a portion of the filter medium is temporarily fixed between the top and the base members and whereat the liquid passages in the top and the base members are aligned, to a second position spaced from the base member to permit movement of the filter medium between the top and the base members and guiding the movement of the filter medium therebetween;

a measuring member having a peripheral portion disposed for drivingly engaging the filter medium with the peripheral portion being of substantially the same length as the cross-sectional dimension of the smaller of the passages of the base and the top members when measured in the direction of travel of the filter medium between the top and the base members;

a cam secured to the container;

means mounting the cam for movement;

a drive connection interconnecting the measuring member and the cam for driving the cam when the measuring member is driven by the filter medium;

circuit means for energizing the drive means;

a switch in the circuit means disposed in operative relationship relative to the cam for energizing the drive means during a major portion of the cam cycle and de-energizing the drive means during a minor portion of the cam cycle;

a second switch in the circuit means disposed in operative relationship relative to the means for moving the top member for momentarily over-riding the first switch to energize the drive means and drive the cam through the major cycle portion thereof to the minor cycle portion to advance a length of the filter medium between the top and the base members of substantially the same length as said cross-sectional dimension; and

means for urging liquid to flow in a path through the passage in the top member, the filter medium, the foraminous member and the passage in the base member when the top member is in the first position.

14. The apparatus of claim 13 wherein the means for moving the top member comprises:

an elongate member secured to the top member between the pivotal connection and the longitudinally extending center line of the top member in the course

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of travel of the filter medium under the top member;

a lever connected adjacent one end portion thereof to the elongate member;

means pivotally mounting the lever intermediate the end portions thereof to the container; and

an actuator engaging the other end portion of the lever for depressing the other end portion of the lever to raise the one end portion thereof to move the top member from the first position to the second position; and wherein

the second switch is in operative relationship relative to the actuator of the top member moving means.

15. The apparatus as set forth in claim 13 further comprising:

a weir formed of upstanding sides surrounding the top and the base members and defining the zone of use with at least one side of the weir having a valve aperture therein communicating with the container;

a valve for closing the valve aperture;

a valve operator connected to the valve; and

means interconnecting the top member and the valve operator enabling the valve to be closed when the top member is moved from the first position to prevent entry of liquid from the container to the weir when the top member is in the second position.

16. The apparatus as set forth in claim 15 wherein the means for moving the top member comprises:

an elongate member secured to the top member between the pivotal connection and the longitudinally extending center line of the top member in the course of travel of the filter medium under the top member;

a lever connected adjacent one end portion thereof to the elongate member;

means pivotally mounting the lever intermediate the end portions thereof to the container; and

an actuator engaging the other end portion of the lever for depressing the other end portion of the lever to raise the one end portion thereof to move the top member from the first position to the second position; and wherein

the second switch is in operative relationship relative to the actuator of the top member moving means.

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