United States Patent

[11] 3,538,962

[72] Inventor **Warren E. Gilson**
4801 Sheboygan Ave, Madison, Wisconsin 53705

[21] Appl. No. **702,419**
[22] Filed **Feb. 1, 1968**
[45] Patented **Nov. 10, 1970**

[54] **COUPLED ARTICULATED CONTAINERS AND APPARATUS UTILIZING SAME**
17 Claims, 12 Drawing Figs.

[52] U.S. Cl. 141/131, 198/131; 220/23.4
[51] Int. Cl. B65b 43/42
[50] Field of Search ..... 141/83, 131, 132, 133; 198/131, (Inquired); 220/94(A), 23.4, (O.S.) Digest: 186/1, (Inquired); 217/65; 59/78(Inquired)

[56] **References Cited**

UNITED STATES PATENTS

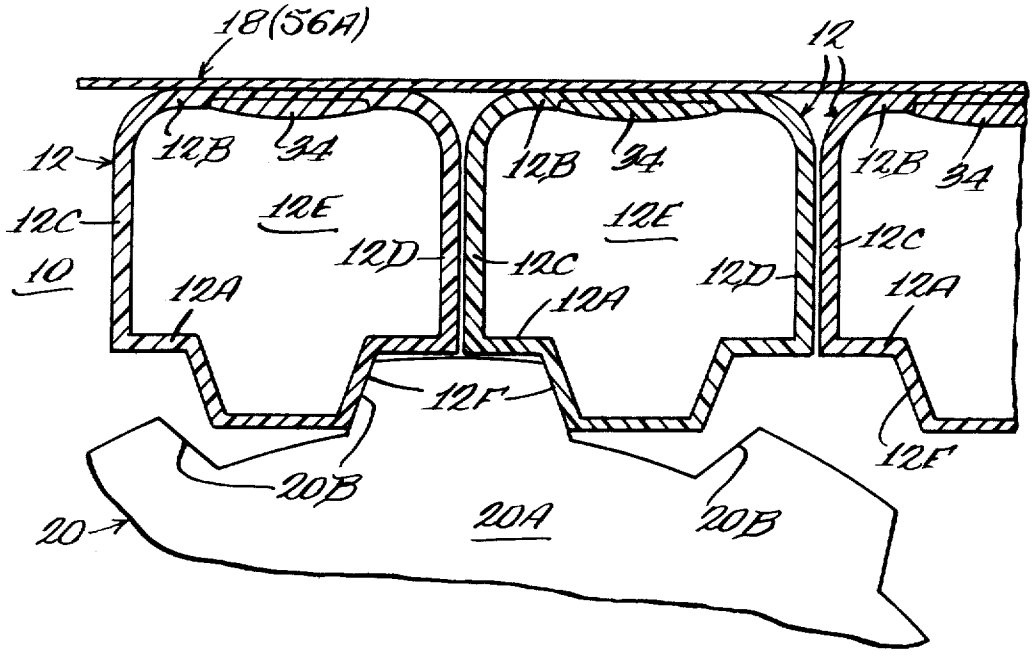
2,823,789	2/1958	Henhing	198/131
2,984,334	5/1961	Dongfelder et al.	198/131

FOREIGN PATENTS

932,605	9/1955	Germany	141/132

Primary Examiner—Houston S. Bell, Jr.
Attorney—Mason, Kolehmainen, Rathburn and Wyss

ABSTRACT: Containers for liquids detachably coupled in hinged or articulated manner and utilizable, for example, with fraction collecting apparatus. The containers have driven means such as gear teeth formed thereon for cooperation as with a drive gear on associated apparatus so that the containers may be driven past a filling or other operating station. The coupling means enables the containers to be formed into arcs so that they can be coiled at the two sides of the station as on supply and takeup spools and remain in vertical position when in use. The containers have positioning stops and also lips at their upper ends that extend over adjacent containers to hold the containers in vertical alignment and to eliminate spillage as the containers are moved past the station. The apparatus includes removable supply and takeup spools to which the containers can be attached and which can be used for storage and transport of the containers. The spools may be driven by power or by hand. The drive can be engaged and disengaged from the containers by a movable supporting and guiding plate and by a pivotally movable plate upon which disengaging means are mounted. The latter also locates light sensitive control apparatus relative to the containers, which are made of transparent material.



Patented Nov. 10, 1970 3,538,962

Fig. 1.

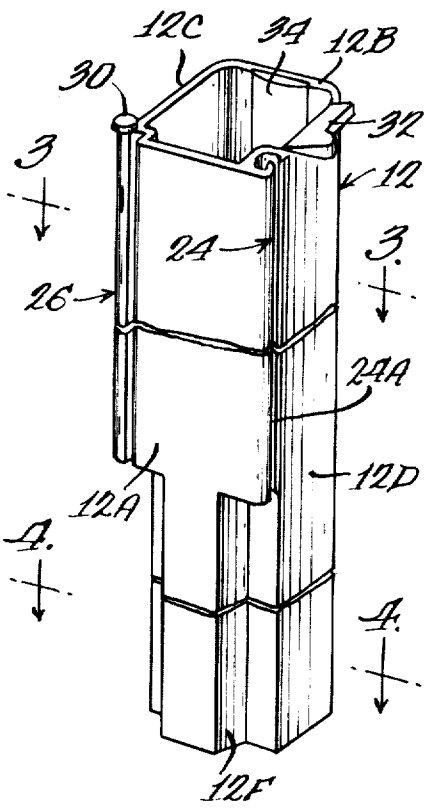


Fig. 2.

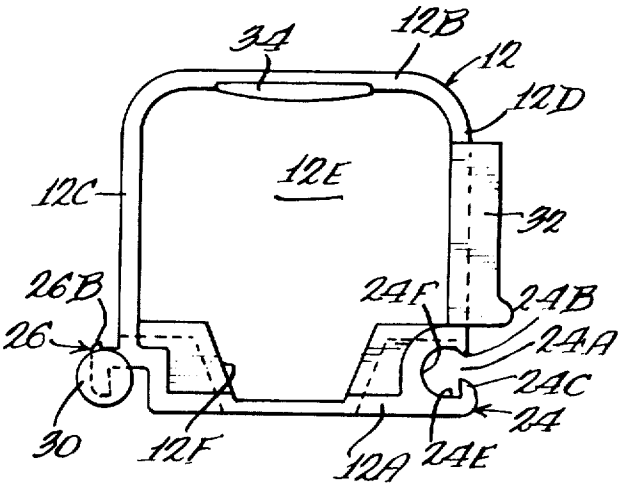


Fig. 3.

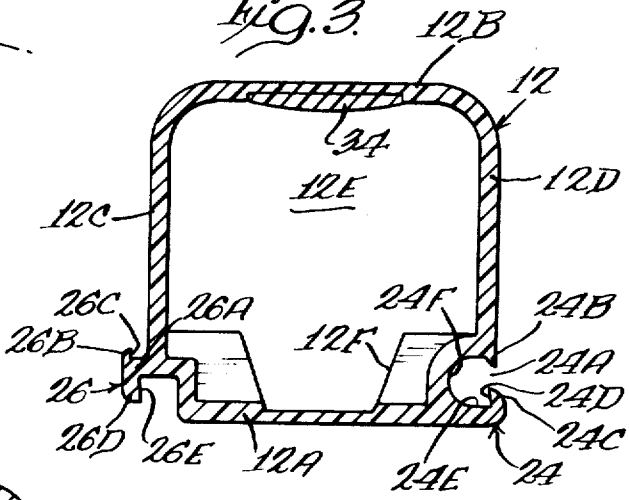
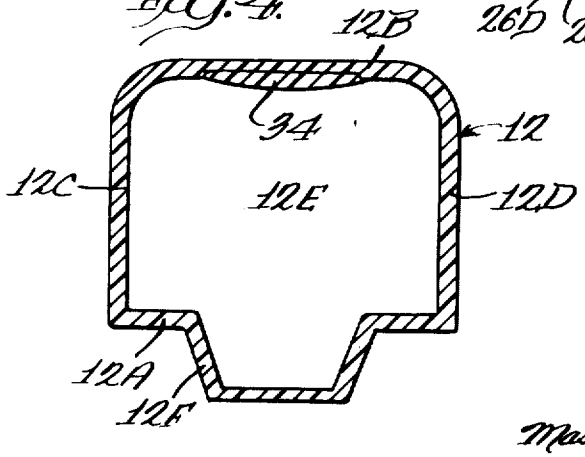


Fig. 4.



Inventor
Warren E. Gilson
By
Mason, Kolehmainen, Rathburn & Wyss
Attys

Fig. 5.

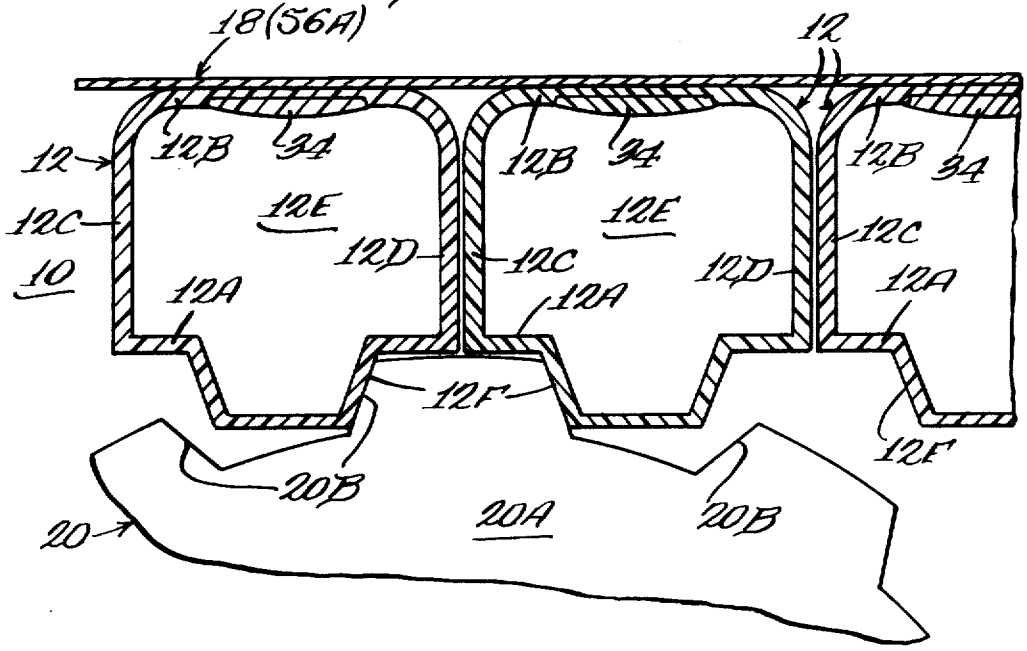
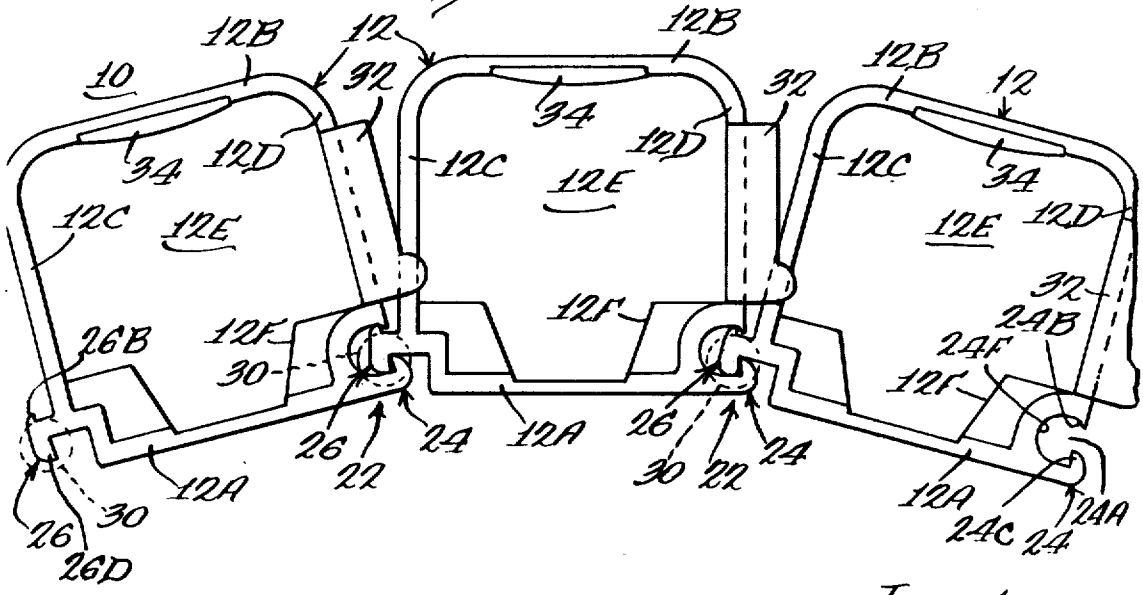


Fig. 6.



Inventor
Warren E. Gilson
By
Mason, Kolehmainen, Rathburn & Wyss
Attys

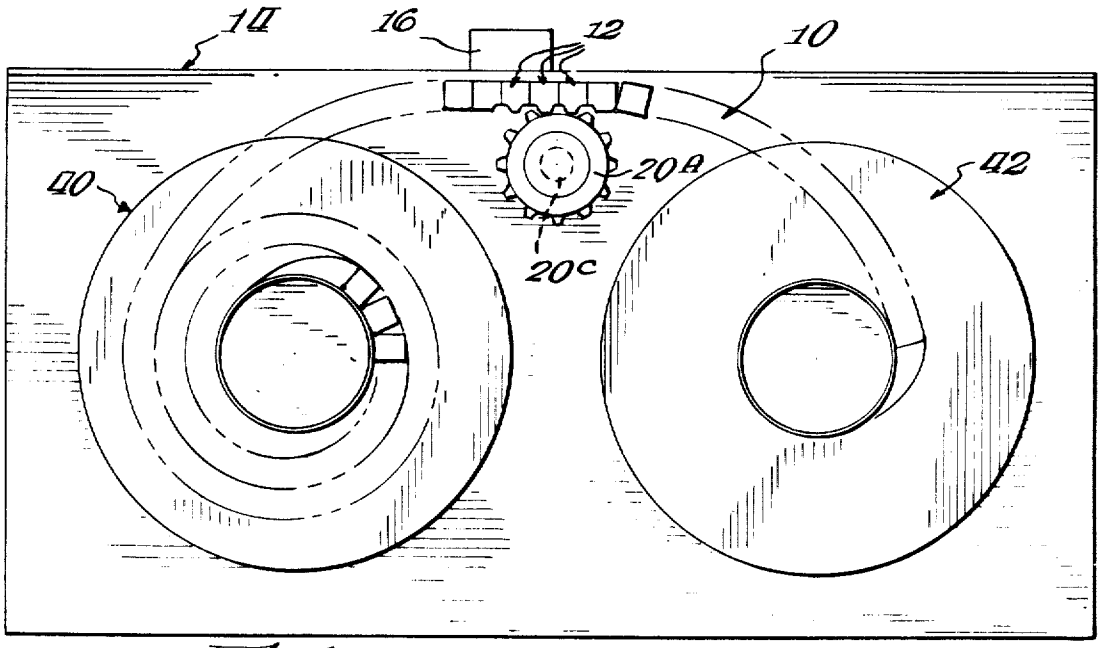


Fig. 7

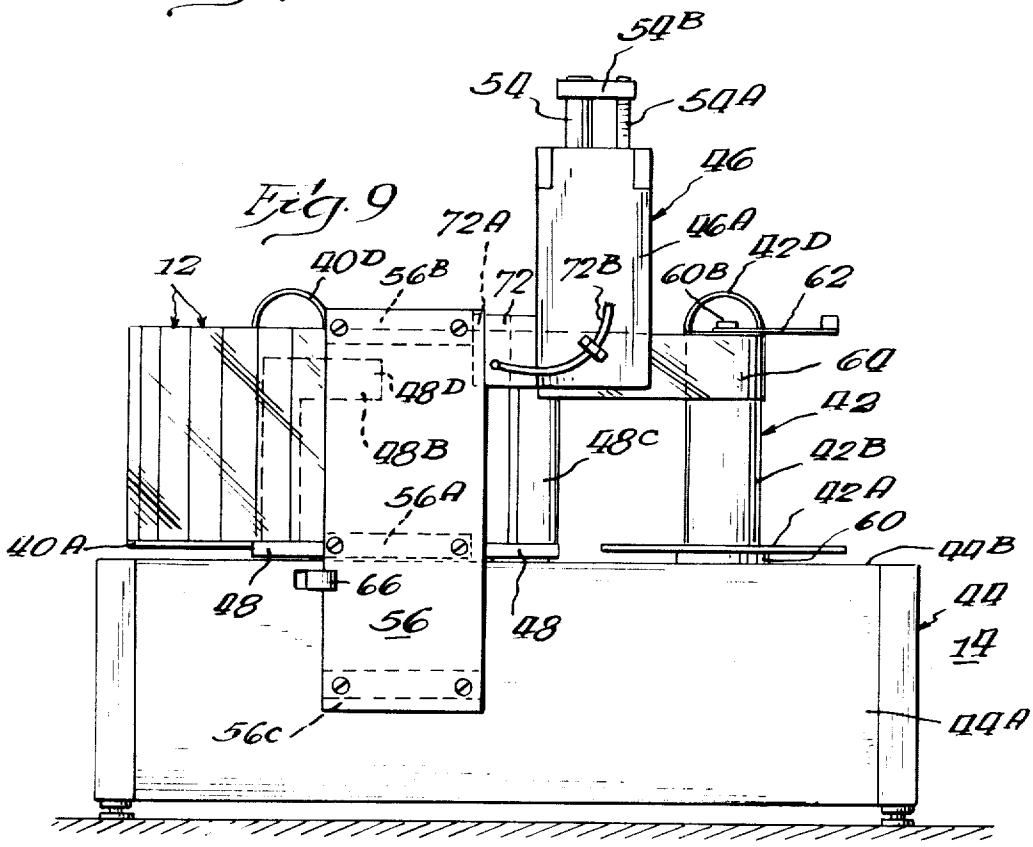


Fig. 9

Inventor
Warren E. Gilson
BY Mason, Kolehmainen, Rathbun & Wyss
Attys

Fig. 8

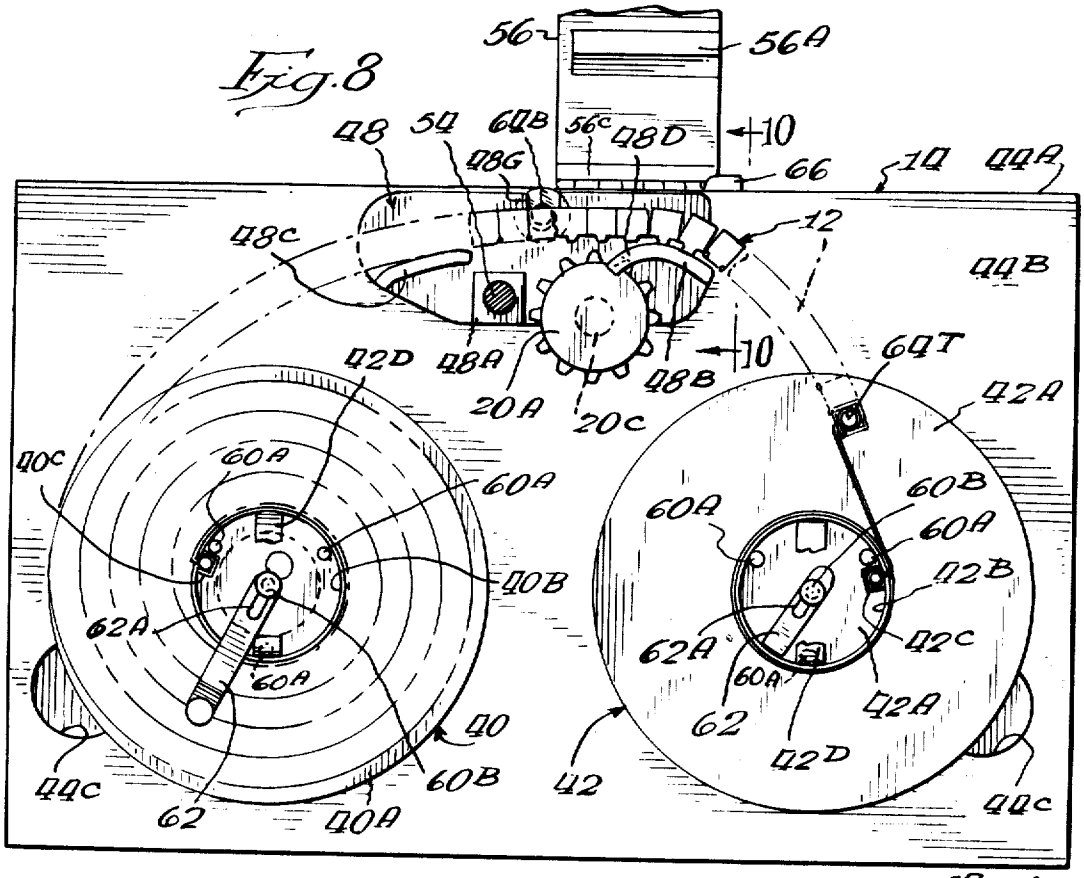


Fig. 10

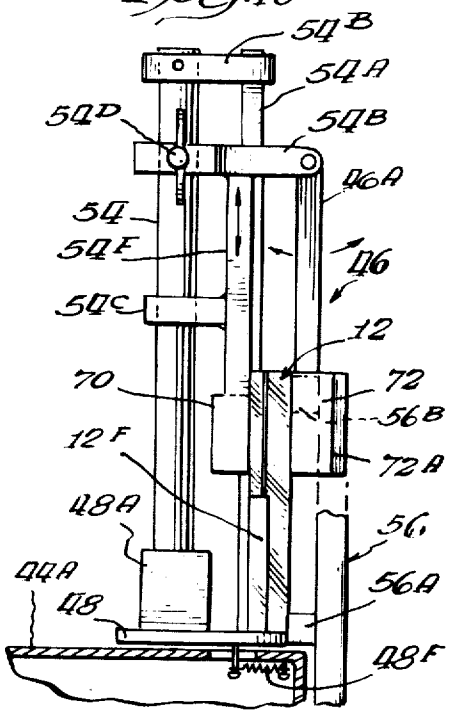


Fig. 11

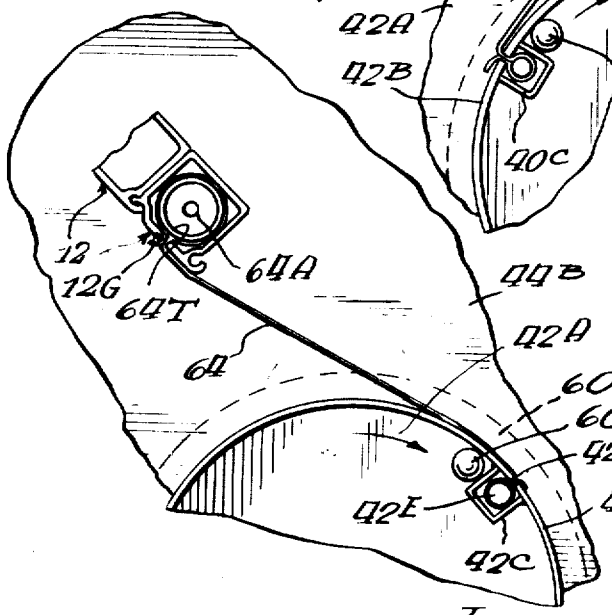


Fig. 12

Inventor
Warren E. Gilson
By Mason, Kolehmainen, Rathburn & Wyss
attys

COUPLED ARTICULATED CONTAINERS AND APPARATUS UTILIZING SAME

CROSS REFERENCES TO RELATED APPLICATIONS

Light-sensitive controls which may be utilized with the apparatus of the present invention are disclosed and claimed in the copending U.S. Pat. application of Warren E. Gilson, Ser. No. 702,273, filed Feb. 1, 1968 and the container couplings are disclosed and claimed, per se, in the copending U.S. Pat. application of Warren E. Gilson and Robert E. Gilson Ser. No. 704,447, filed Feb. 9, 1968, now U.S. Pat. No. 3,490,296.

FIELD OF THE INVENTION

The invention pertains to containers, such as test tubes, utilizable for a variety of purposes, *e.g.*, liquid fraction collecting, and apparatus including means for supporting and moving the containers past an operating station at which the containers are either filled, emptied or put to other use.

DESCRIPTION OF THE PRIOR ART

The fraction collection and other apparatus utilizing a number of containers, such as test tubes, are used in a variety of applications. Generally the containers are mounted in racks that are moved past a station. In some arrangements the tubes are supported as in a flexible belt-type carrier or upon a turntable. The elimination of separate tube supports and simple and compact coupling, supporting and driving arrangements and the prevention of spillage are desired.

SUMMARY

Separate container supporting means of the prior art are eliminated and a simple compact drive is provided by constructing the containers with articulated snap-type connecting or coupling means and with driven means preferably integral with the containers for engagement by an associated drive means whereby there is provided a flexible array of interconnected containers that are self-supporting and readily driven past an operating station. The coupling between the containers enables them readily to be formed into an arcuate configuration whereby the containers are maintained in vertical position in coiled form in use and to be placed in a straight line intermediate the coils. The containers may be provided with positioning stops and lips extending from one to an adjacent container thereby to prevent spillage and with lens for use with light responsive liquid level controls. The apparatus of the invention is adapted to effect power or manual drive of the containers, easy engagement and disengagement of the power drive and accurate location of associated controls simultaneously with the engagement of the drive.

Other objects and advantages of the present invention will become apparent from the ensuing description of illustrative embodiments thereof, in the course of which reference is had to the accompanying drawings, in which:

FIG. **1** is a fragmentary perspective view of a single container constructed in accordance with the present invention;

FIG. **2** is a top plan view of the container;

FIGS. **3** and **4** are transverse cross-sectional views taken along the lines **3–3** and **4–4** of FIG. **1**, respectively;

FIG. **5** is a fragmentary enlarged cross-sectional view of coupled containers taken along a line corresponding to line **4–4** of FIG. **1** and showing primarily the containers in relation to container driving means;

FIG. **6** is a fragmentary top plan view of a plurality of coupled containers illustrating the articulated or hinged connection or coupling between containers providing limited angular movement between adjacent containers;

FIG. **7** is a simplified diagrammatic top plan view of a mechanism including means for driving the containers past an operating station;

FIG. **8** is a fragmentary top plan view, partly broken away, of apparatus constructed in accordance with the present invention;

FIG. **9** is a front elevation of the apparatus;

FIG. **10** is a fragmentary vertical cross-sectional view taken along the line **10–10** of FIG. **8**, with certain parts omitted; and

FIGS. **11** and **12** are fragmentary plan views illustrating details of the connections of coupled containers to takeup and supply spools included in the apparatus.

Referring now to the drawings and first to FIG. **7**, there is illustrated a coupled assembly **10** of individual containers **12** constructed and arranged in accordance with the present invention. The containers have, as illustrated in FIGS. **1** to **6**, rear walls **12A**, front walls **12B**, and side walls **12C** and **12D** and they are generally rectangular in cross section except where this shape is modified to provide the driven elements or portions **12F** hereinafter described. The containers are open at their upper ends and have bottoms **12E**. They are preferably of integral and substantially rigid construction, being molded of polyethylene, polypropylene, acrylic resin or the like.

The containers **12**, as will be described in greater detail hereinafter, are connected as by snap-type coupling means for limited angular movement relative to one another whereby they can be coiled in self-supporting vertical position upon supply and takeup spools **40** and **42**, respectively of an apparatus indicated generally by reference character **14**. The hinged or articulated arrangement of the containers enables them readily to be stored, transported and utilized in coiled form upon the spools. Additionally, the containers are similarly self-supporting as upon a flat surface or the like apart from the spools. The apparatus **14** may be utilized for various purposes. It may be, for example, a laboratory or clinical sample handling apparatus of a type in which the containers are adapted to be driven past an operating station **16** which may include a conventional filling mechanism, such as used with fraction collecting apparatus. The containers are adapted to be filled to a predetermined level and to be moved sequentially past the operating station. As illustrated somewhat diagrammatically in FIG. **5**, the containers are maintained in desired vertical position near the operating station and opposite drive mechanism **20** comprising a drive gear **20A** by an engaging plate **18** to be described in greater detail hereinafter in connection with FIGS. **8** through **12**.

The drive gear **20A** has individual gear teeth **20B** and is adapted to be rotated by a motor drive shaft **20C** operatively connected to the motor (not shown) and which is adapted intermittently to be moved under the control of suitable indexing or other controlling means (not shown) of a type which may be conventionally used in fraction collecting apparatus and which may be controlled in response to a liquid level control device, such as that described briefly hereinafter and which may specifically be of the character described and claimed in the copending U.S. Pat. application of Warren E. Gilson, Ser. No. 702,273.

In accordance with the present invention, the containers are constructed so that they may be readily coupled to each other in hinged or articulated relationship and they are provided with unitary or built-in driven means cooperating with the drive mechanism **20**.

The built-in driven means will be described first, more particularly in conjunctions with FIGS. **1**, **2**, **4** and **5**. From these FIGS. it will be noted that the individual driven elements **12F** of the containers have cross-sectional configurations of gear teeth. The teeth are preferably integrally formed in the containers which are made of suitable plastic material. As best illustrated in FIG. **1**, the gear teeth extend over a substantial length of the container, *e.g.*, the lower half, whereat they are readily engageable by the gear teeth **20B** of the drive gear **20A**. If desired, the gear teeth could be made otherwise and located elsewhere, as for example at the bottom of a container. Additionally, the gear tooth portion may be made relatively short and by a substantially solid bottom portion of the container. The drive gear teeth **20B** and the driven gear teeth **12F** are so dimensioned that when the containers are opposite the drive gear there is substantially full meshing between the driving and driven elements.

The coupling is of a type disclosed and claimed in the copending U.S. Pat. application of Warren E. Gilson and Robert E. Gilson and will now be described particularly with reference to FIGS. 1, 2, 3, 5 and 9. The coupling enables the containers readily to be coupled to each other in hinged or articulated relationship as well as uncoupled, both the coupling and uncoupling being of the snap variety and effected by relative angular movement of the containers beyond a normal range of articulation or angular movement. Also, uncoupling cannot be effected by direct pull. The couplings, indicated by reference character 22, include opposed coupling members 24 and 26 which are arranged so that they can be readily coupled and uncoupled as by snap action. The coupling is also such that it is difficult to effect uncoupling by a direct pull. One of the coupling members, for example member 24, is shown as having the configuration of a groove while the coupling member 26 takes the form of a hook. The members may be snapped together by forcing, with some pressure, the hook into the groove by rotary movement of the two members. Preferably, the grooves and hooks are located near adjacent corners of the containers 12, with the grooves at one end of wall 12A and the hooks at the other end.

Each of the grooves includes a longitudinal opening 24A the edges of which are defined by a small generally triangular forwardly extending projection 24B and a somewhat larger rearwardly extending portion 24C having an inner abutment surface 24D extending at an acute angle from an adjacent portion 24E of the groove. The portion 24E merges into a generally semicircular portion 24F that connects with the projections 24B.

The hook 26 includes a lateral extension 26A from which a small generally triangular portion 26B extends rearwardly and having a short surface 26C disposed at right angles with surface 26A. The hook includes also a forwardly extending relatively large projection 26D provided with a surface 26E having an acute angular relation with the front side of lateral extension 26A. Surfaces 24D of the groove and 26E of the hook are complementary to each other so that when the coupling members are connected to each other it is almost impossible to separate the two members with a direct pull, irrespective of the angular relationship.

The coupling of the elements is effected by lateral insertion of the hook projection 26D into opening 24A of an associated groove. The hook is snapped into the groove by a rotational motion of the two coupling members relative to each other. In effecting snap coupling the hook projection 26D rotates about the projection 24C of the groove to effect snapping of projection 26B past lip 24B, with which it has an interference fit.

Uncoupling is effected by rotation of the members in the opposite direction to snap hook projection 26B out of the groove past lip 24B.

The desired and limited normal range of angular movement of one part relative to another is determined by the configuration and dimensions of the coupling members. As best shown in FIG. 6, the limit of angular movement in one direction is determined by engagement of hook parts with groove parts. As illustrated, there is substantial engagement between the hook and groove structures such as to prevent uncoupling by direct pull. The engagement is between lip 24B and the projection 26B, lip 24C and surface 26E, and between surface 24E and the end of projection 26D. The limit of movement in the opposite direction is substantially that shown in FIG. 5, whereat side walls of the containers (or projections thereon, not shown) may abut. It should be noted that coupling and uncoupling are effected by rotary movement of one member relative to another at an angular range outside the normal range. The illustrated construction provides about 15° of relative angular movement.

Means are provided accurately to position and maintain the containers in vertical alignment. This means includes a stop, such as the stop 30 at the upper end of the hook coupling member, and a lip 32 having a generally triangular vertical cross-sectional configuration and located at the upper end of container wall 12D. The stop and lip project from one container over a portion of an adjacent one, as best illustrated in FIG. 6, thereby to prevent longitudinal relative movement but without interfering with angular movement.

The lip 32 also serves to prevent spillage of fluid or the like between adjacent containers, the lip directing any liquid which may fall thereon into an adjacent container. It should be noted that the lip directs falling liquid thereon into the container of which it forms a part, rather than into a region between adjacent containers. The lip may have a trough-shaped top rather than the illustrated flat surface.

The containers are also provided with built-in cylindrical lens 34 along a desired length of the container. The lens is advantageously molded integrally with the container and at the interior of the wall 12B. If desired a second lens could be similarly formed at the interior of wall 12A. An advantage of the construction results from the location of the lens between the side couplings of the containers, which permits setting of the level control at any point along the height of the container undisturbed by an external container holding means. The containers may be used with photoelectric controls actuated in response to darkening when the liquid reaches a desired level, as disclosed and claimed in the copending Warren E. Gilson U.S. Pat. application (Gilson Case GM 4). The lens increases the differential between no liquid and liquid as the light-concentrating effect of the lens is diminished when it is under the liquid, the refractive index of the liquid being closer to that of the plastic of which the container is made than is the refractive index of air.

The coupled containers are adapted for use in the apparatus 14 of the present invention which will now be described in conjunction with FIGS. 8 through 12. The apparatus includes the previously referred to drive gear 20A driven by shaft 20C and the supply and takeup spools 40 and 42, removably mounted on rotatable supports. In addition, the apparatus includes, in the main, a base structure 44, a vertically adjustable liquid level control assembly 46, a horizontally movable mounting plate 48 supporting the containers adjacent the drive gear 20A and a pair of upstanding arcuate container-guiding elements 48B and 48C, the plate being pivotally movable about a support post 54, and drive disengaging and interlock plate 56 maintaining the containers engaged with the drive gear and the level control assembly in position.

The base structure 44 is illustrated as comprising a cabinet 44A having a top 44B. The drive gear 20A is mounted on and above the top and its associated drive shaft 20C extends below the top where it can readily be driven by a motor (not shown) also mounted underneath the top. The takeup spool 42 support may be driven by the motor as by a friction-type belt from the drive shaft in known manner. Rotation of the supply spool support may be retarded also in known manner as by a friction element. The drive gear teeth 20A extend for substantially the full length of the driven gear elements 12F, which may extend about one-half the height of a container.

The supply and takeup spools 40 and 42 are of identical construction and like reference characters will be utilized to indicate the like parts thereof. Referring to spool 42, it includes a flat circular base plate 42A and an upstanding tubular hub or spindle 42B. The size of the spool base plate depends on the number of containers to be used. For one number of containers, the plates may be of the size illustrated and mounted as illustrated. If a greater number of containers are to be utilized, the spools may have larger base plates and mounted openings 44C located a further distance apart from each other and from the drive gear, as illustrated in FIG. 8.

The spools are removably mounted upon rotatable support plates 60 journaled in suitable bearings in the top 44B and of which the plate associated with the takeup spool is driven and the one associated with the supply spool is retarded, as earlier noted.

The spools are connected for rotation with the supports 60 by upstanding spaced pins 60A on the supports and which extend up into the tubular spool part 42B. The pins fit relatively

closely in the tubular part effectively but detachably to hold the spool in place. The driving connection between the pins and spool includes a vertical compartment **42C** at the inside of tubular part **42** which is adapted to abut against one of the pins **60A**. Thus, a pin **60A** drives the driven takeup spool and compartment **42C** on the supply spool rotates its associated support plate **60**.

Manual rotation of the spools is provided by a manual drive comprising a rotatable handle **62** engageable with a diammetrical spool handle **42D** secured to the upper end of tubular portion of the spool. The handle is somewhat semicircular and extends above the upper end of the tubular portion. The drive handle **62** is rotatably mounted upon a central pin **60B** attached to each of the plates **60**. The handle is provided with a slot **62A** so that the handle can be moved to project generally at right angles to the spindle to engage a spool handle, as shown in FIGS. **8** and **9**, or be located essentially within the tubular part, as shown in FIG. **8**. In other words, the handle may be considered to be disposable within the tubular part of the spool when the mechanism is in operation, if manual operation is desired, and it can be retracted and then rotated to move either the takeup or supply spool. Complete withdrawal of the handle is prevented by constructing the central posts **60B** with an enlarged upper end.

Connection of a coupled array of tubes to a spool spindle can be effected readily as by a piece of flexible plastic tape **64** extending from an end container to the spool spindle. Referring now to FIG. **11**, it may be noted that an end portion of the tape **64** is looped around pin **42E** of the takeup spool mounted within the compartment **42C**. The upper end of the tubular portion **42B** of the spool is provided with a narrow slot **42F** whereby the looped tape **64** can be inserted around the pin. The tape has a length such that it can be wrapped around the tube spindle several times (see FIG. **8**) thereby effectively to tie the coupled containers to the spool.

The tape **64** can also be readily connected to an end container **12** as best illustrated in FIG. **11**. As shown, the end container is provided with an insert which may take the form of a round tube **64T** or the like spaced from the inside of the container walls so that the end portion of the tape **64** may be looped around it, the end container having a slot **12G** through which the tape can enter the container. The tape may have a desired width considerably less than the height of the containers and the slots in the spool and end containers may have a corresponding height. The tape **64** is similarly used to connect the supply spool to the containers, as shown in FIG. **12**.

The tubes located in the end containers, and also the end containers are apertured at their lower ends so that liquid collecting in them at initial and end positions of the containers, when being filled, may be drained through a drain outlet **64B** in top **44B** below a cutaway portion **48G** of plate **48**. The opening **64B** is located so as to be aligned with opening **64A** of an end container at the beginning and the end positions of the containers when they are being filled.

The vertical support post **54** is fixedly mounted upon and extends above the top **44A**. A downwardly extending guide post **54A** is secured to the upper end of post **54** by an arm **54B**. The posts are mounted near the front of the cabinet between the spools.

The container supporting plate **48** is located above the top **44A** and also near the front of the cabinet. It is at the level of the spool support plates **40A** and **42A** and, in accordance with a feature of the invention, the plate is mounted for horizontal pivotal movement for the purpose of effecting disengagement of the coupled containers from the drive gear when it is desired, for example, to change spools or to move the spools manually. Referring now to FIGS. **8**, **9** and **10**, the plate **48** is supported for pivotal movement about the post by a bearing structure **48A**. The plate is biased toward the front of the apparatus to the position indicated in FIG. **8** and in which position the drive gear **20A** is disengaged from the containers. The disengagement is effected by a first guide plate **48B** mounted near an end of the plate. The opposite end of the plate is provided with a second arcuate guide plate **48C**. The latter is of uniform width throughout its height, but the disengagement guide plate **48B** is somewhat L-shaped and mounted in inverted position so that its upper horizontal portion **48D** is above the top of the drive gear **20A** and thus clear of the latter.

The plate **48** is biased toward its normal forward position by suitable spring means, such as the spring **48E** illustrated in FIG. **10**, and connected to the cabinet and to the underside of the plate.

Movement of the plate against its bias to effect engagement of the containers with the drive gear is effected by the plate **56** located at the front of the apparatus, as illustrated in FIGS. **9** and **10**. The plate is of substantial height and pivots about a horizontal axis defined by hinge **56C** near its lower end. It is provided with two transversely extending bars **56A** and **56B** both of which are at the rear of the plate so as to engage the upper and lower ends of the containers **12** effectively to hold the containers in position as they are moved by and past the drive gear. Additionally, the lower bar **56A** effects movement of the plate and guide means **48B** to effect engagement of the containers. It may be well to note that bar **56A** corresponds to guide **18** of the diagrammatic showing of FIG. **5**. The plate **56** is latched in its gear-engaging position by a spring biased latch finger **66**. The latter is movable transversely of the plate to release plate **56**.

The plate **56** performs the additional function of properly locating and holding in place the liquid level control assembly **46**, or, more specifically, part of it. The liquid level assembly is vertically adjustable on the support and guide posts **54** and **54A**, this being accomplished by the generally horizontally extending upper and lower arms **54B** and **54C**, which are apertured so as to be slidable on the posts. The assembly may be held in its desired vertical position by a thumb screw **54D**.

The liquid level control assembly includes a housing **70** for a light source (not shown). The housing is mounted at the lower end of a downwardly extending support plate **54F**. The control assembly includes also a light-sensitive device mounted in a housing **72** secured to the lower end of a support plate **46A** pivotally mounted for horizontal movement at the upper end of the support **54B**. The arrangement is such that the light source and light-sensitive device are at opposite sides of the containers passing between them. The assembly is vertically adjustable so that the containers may be filled to a desired level.

The light-sensitive device is held in desired accurately located position with the light and photocell housings abutting opposite sides of the containers by an interlocking arrangement of the upper end of the plate **56** which engages a recess end portion **72A** of the light-sensitive element **72**. The latter may be connected by conductors **72B** to suitable control apparatus such as an indexing control whereby the containers are movable in sequence past the operating station.

It is believed that the construction and operation of the apparatus of the present invention will be clear from the foregoing. In any event, the containers may be made readily and economically. They are adapted readily to be coupled or uncoupled from each other even when on the apparatus. The articulated coupling provides sufficient flexibility to a coupled array that one or more of the containers may be uncoupled and removed for any desired purpose. Also, the coupled containers can be readily mounted upon and secured to a spool, the securing being done by means of the tapes **64**, which can be readily secured to the end containers and to the pins **40E** or **42E** of the spools. The spools provide a convenient storage place for coiled containers and the spools can be readily carried by means of the handles **40D** or **42D**.

The spools can be readily mounted on the spool rotating plates **60** wherein driving connections are insured by the abutting relationship of the pins **60A** and compartments **40C** or **42C**.

The containers may be moved manually at any time either in a forward direction toward the takeup spool or for rewind-

ing on the supply spool upon lifting of the handle **62** from the position shown at the right of FIG. **8** to the position shown at the left in the same FIG. followed by rotation of the handle.

The manual operation in either forward or rewind direction is best carried out when the drive gear is disengaged from the containers, as shown in FIG. **8**. This disengagement is effected readily and simply upon moving latch **66** to release plate **56** and then lowering the latter. When this is done the plate **48** is moved by spring **48E** to the position of FIG. **8** wherein the container guide **48B** disengages the containers from the drive gear. The guides **48B** and **48C** guide the containers in both their engaged and disengaged positions. At the same time, the photosensitive device is released and the container between the device and light source are freed for easy movement.

To effect engagement of the containers with the drive gear all that is necessary is to move lever **56** to its vertical position as indicated in FIG. **9** where it is latched by latch **66**. At the same time, the photosensitive control assembly **46** is latched by engagement of plate **56** with the portion **72A** of the photosensitive control. This interlocking operation occurs at all positions of adjustment of the level control assembly **46** on support and guide posts **54** and **54A**.

The apparatus may be operated manually or conventional indexing controls operated in response to the functioning of the liquid level control assembly may be utilized to effect intermittent sequential operation.

Liquid inadvertently falling from associated filling means (not shown) will go into the drain opening **64B** when no containers are present and will go through the end container openings **64A** into the drain at the end limit positions of the containers.

Spillage during movement of the containers is prevented by the overhanging lips **32**, which direct any liquid falling thereon into associated containers.

While the present invention has been described in connection with the details of illustrative embodiments, it should be understood that such details are not intended to be limitative of the invention except insofar as set forth in the accompanying claims.

I claim:

1. Apparatus of the character described including an array of articulated coupled transparent containers each having a driven element thereon, a driving element engageable with the driven elements of the containers for effecting longitudinal movement of the containers, means supporting the containers adjacent the driving element, means for effecting transverse relative movement between the driving element and adjacent containers to effect engagement and disengagement of the drive, light-sensitive control means adjacent opposite sides of the containers near the drive means, said control means including a movable portion engageable by the transverse movement effecting means to maintain said movable portion in abutting relation with containers moving past it, and rotatable and removably mounted supply and takeup spools having container supporting portions at the level of the means supporting the containers adjacent the driving element.

2. Apparatus as claimed in claim **1**, wherein said spools include upper tubular portions.

3. Apparatus as claimed in claim **2**, wherein said tubular portions have spool-carrying handles.

4. Apparatus as claimed in claim **2**, including rotatable support plates upon which the spools are mounted, said plates including upstanding posts extending into and having a driving connection with the tubular spool portions.

5. Apparatus as claimed in claim **4**, wherein said supports have central posts and a handle is retractably mounted on each of said central posts for engaging, when extended, the spool carrying handle of the spool mounted on the support.

6. Apparatus as claimed in claim **1**, wherein the end containers are secured to the spools by tape.

7. Apparatus as claimed in claim **6**, wherein the spools are provided with compartments having central pins and access openings for the tape to enable the tape to enter and leave the compartment and to be wrapped around the pin.

8. Apparatus as claimed in claim **6**, wherein the end containers are slotted to receive the tape and provided with inserts around which the tape may be encircled.

9. Apparatus for handling liquids and the like comprising in combination:

an array of articulated containers;

a horizontally disposed pivotally mounted plate defining a supporting surface for slidably supporting said containers;

a driven element on each container;

a driving element engageable with said driven elements for effecting movement of the array of containers across the supporting surface;

a container-engaging guide means mounted on said horizontally disposed plate; and

means for pivoting said plate to move said guide means between a first position wherein said containers are moved transversely away from said driving element to disengage said driven elements therefrom and a second position wherein said driving element engages said driven elements.

10. Apparatus as claimed in claim **9**, wherein said driven elements are constituted by individual gear teeth on the respective containers and the driving element is a rotatable toothed gear at the upper side of the supporting surface.

11. Apparatus as claimed in claim **9**, wherein the end containers of the array have apertured bottoms.

12. Apparatus as claimed in claim **11**, wherein tubes with apertured bottoms are located in said end containers.

13. Apparatus as claimed in claim **12**, wherein a drain opening is provided on the apparatus and with which the end containers may be aligned in limit positions.

14. The apparatus of claim **9**, said pivoting means comprising spring means urging said plate toward said first position, a second plate mounted for generally vertical pivotal movement and movable to an operating position in which said second plate engages said first plate and moves said guide means to said second position.

15. Apparatus as claimed in claim **14**, wherein releasable latch means are provided to hold said second plate in said operating position to effect engagement of the drive.

16. The apparatus of claim **14**, further comprising means mounted on said second plate engageable with said array of containers in the operating position of said second plate for positively moving said driven elements into engagement with said driving element.

17. The apparatus of claim **16**, further comprising liquid level control means mounted at least in part on said second plate.