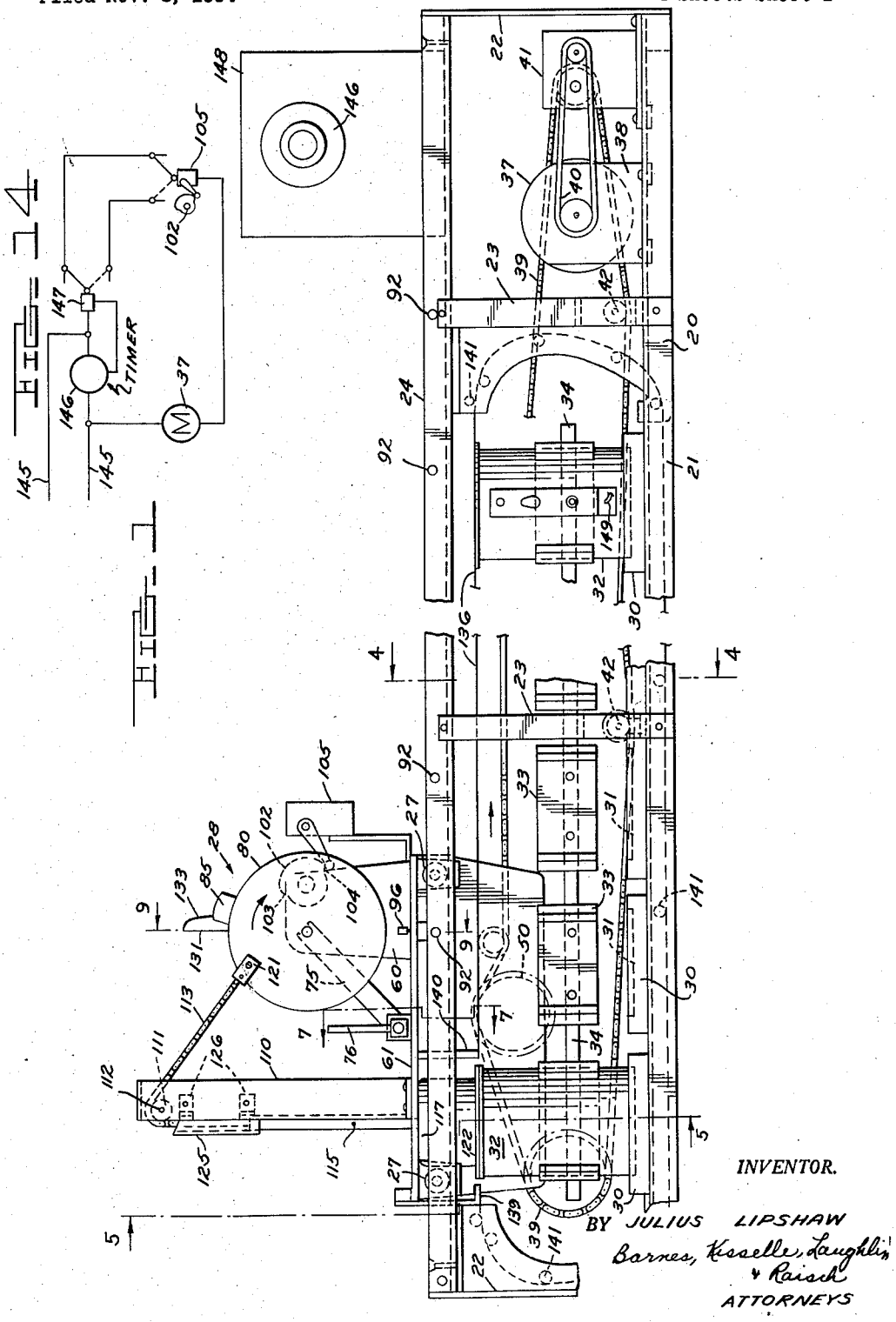
Sept. 23, 1958 J. LIPSHAW 2,853,084

AUTOMATIC SUCCESSIVE PROCESSING APPARATUS

Filed Nov. 8, 1954 4 Sheets-Sheet 1



Sept. 23, 1958 J. LIPSHAW 2,853,084

AUTOMATIC SUCCESSIVE PROCESSING APPARATUS

Filed Nov. 8, 1954 4 Sheets-Sheet 2

FIG. 2

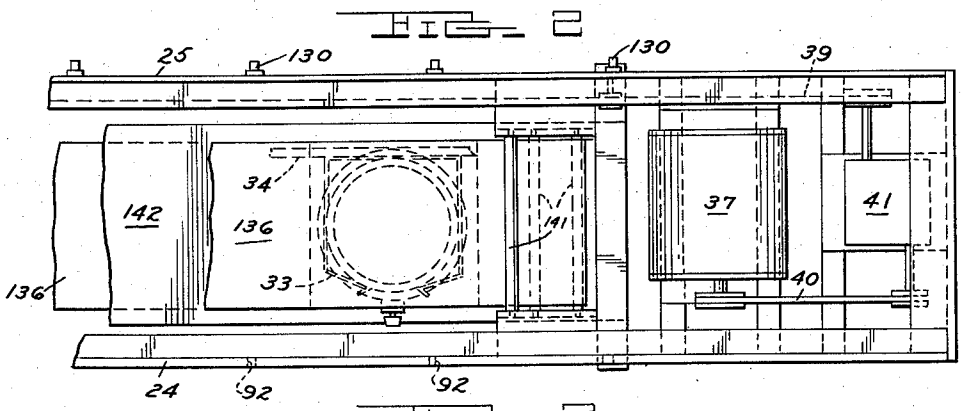


FIG. 3

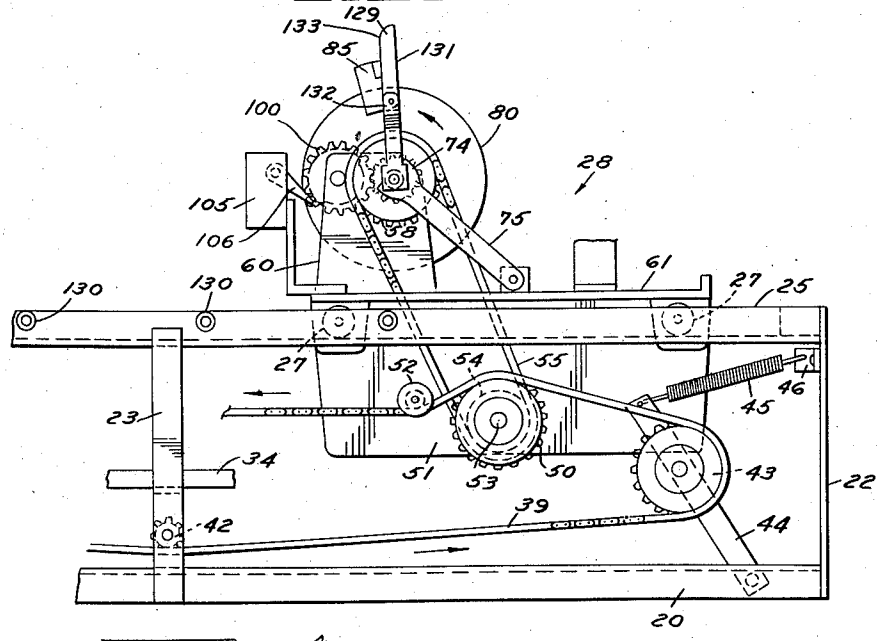
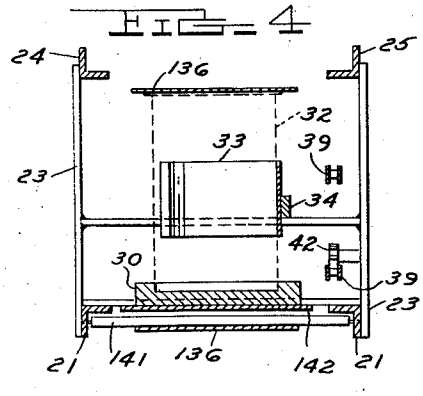


FIG. 4



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Sept. 23, 1958 J. LIPSHAW 2,853,084

AUTOMATIC SUCCESSIVE PROCESSING APPARATUS

Filed Nov. 8, 1954 4 Sheets-Sheet 3

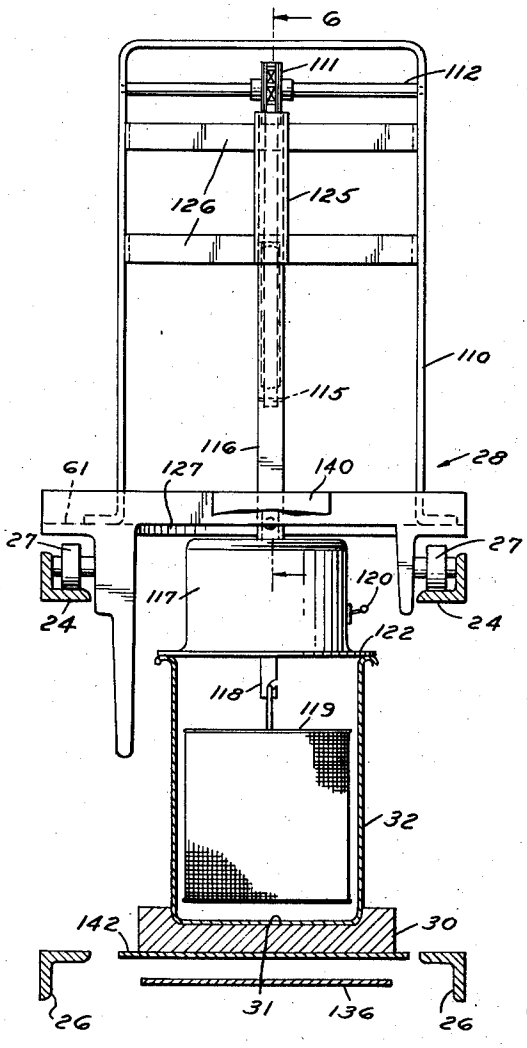

FIG. 5

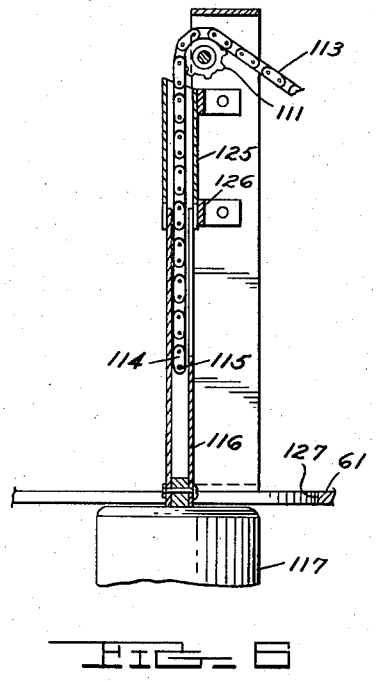

FIG. 6

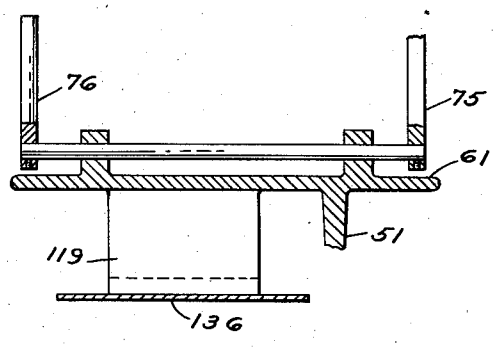

FIG. 7

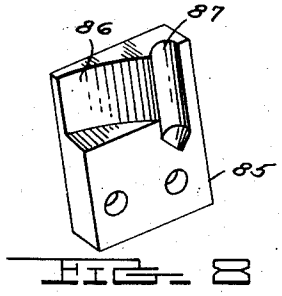

FIG. 8

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Sept. 23, 1958 J. LIPSHAW 2,853,084

AUTOMATIC SUCCESSIVE PROCESSING APPARATUS

Filed Nov. 8, 1954 4 Sheets-Sheet 4

FIG. 13

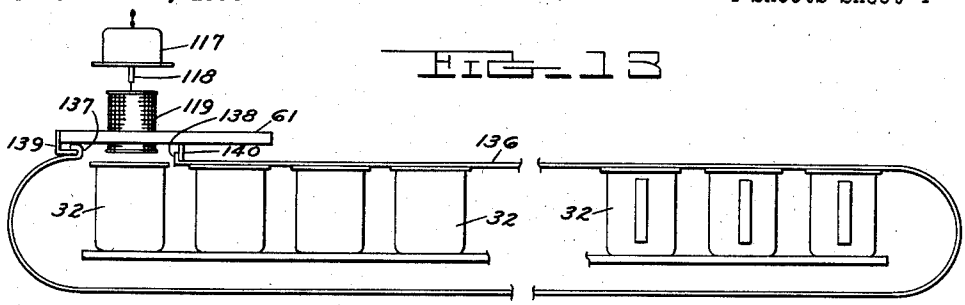


FIG. 9

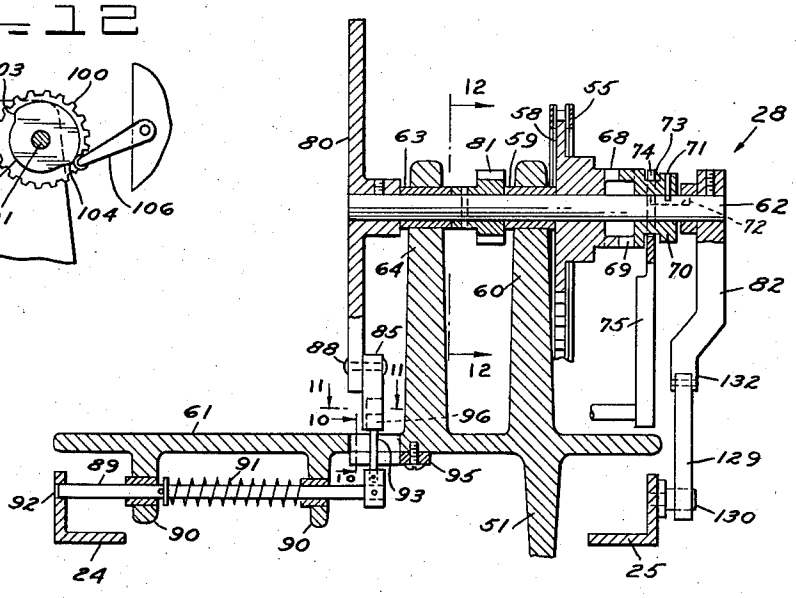


FIG. 12

FIG. 11

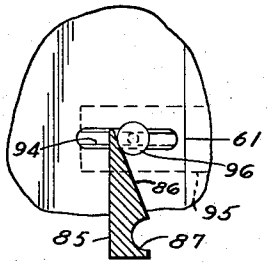
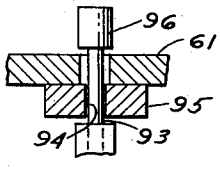


FIG. 10



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2,853,084

AUTOMATIC SUCCESSIVE PROCESSING APPARATUS

Julius Lipshaw, Detroit, Mich.

Application November 8, 1954, Serial No. 467,341

20 Claims. (Cl. 134—76)

This invention relates to a device for automatically treating articles at a succession of processing stations.

The device can be used wherever an article or articles are to be subjected to a succession of treatments in different receptacles or closures and is especially well adapted for immersing organic tissue in a succession of baths preparatory to microsection for pathological study and the like.

Tissue processors now used usually comprise a circular array of fluid containing beakers with a central hoist having a number of radial arms. One arm carries a basket for the tissue and the other arms carry lids for the beakers. The hoist elevates the arms, rotates them and lowers them for transferring the tissue from one bath to another and the lids are transferred from beaker to beaker. The mechanism producing this motion is relatively complicated and expensive and it frequently gets out of phase, necessitating costly repairs and causing a considerable loss of time.

The relatively large number of moving parts and the length of the radial arms and hoist members introduces whip and play into the mechanism which often results in faulty operation and breakage; and the rotary transfer motion tends to sling the basket and lids free of the radial arms. Accordingly, the transfer must be accomplished slowly, usually requiring two to three minutes, and during this time all of the lids are elevated so that quantities of the more volatile processing fluids are lost through evaporation and dangerous concentrations of vapors may build up in the processing room. The round type processor must be spaced from adjacent walls and articles sufficiently to permit access to all sides of the processor so that it takes up a relatively great amount of floor space.

An object of this invention is to provide a compact, simple, inexpensive tissue processing apparatus which transfers the tissue rapidly from one bath to another with negligible evaporation of fluids and which is virtually foolproof of operation.

The invention generally contemplates the use of a rectilinear arrangement of fluid containing beakers with a tissue immersion basket reciprocably supported by a carriage movable in a line adjacent the beakers. A single flexible belt attached to the carriage provides a travelling cover for all of the beakers. The belt has a single opening at the carriage to pass the basket into and out of the adjacent beaker. One form of the invention is shown in the accompanying drawings which may be briefly described as follows:

Fig. 1 is a partly diagrammatic side elevational view of apparatus according to this invention with some parts illustrated in phantom.

Fig. 2 is a fragmentary, partly diagrammatic top plan view of the device.

Fig. 3 is a partly diagrammatic elevational view illustrating the carriage and parts of the drive mechanism.

Fig. 4 is a generally sectional view on line 4—4 of Fig. 1.

Fig. 5 is a generally sectional view on line 5—5 of Fig. 1 illustrating parts of the carriage and reciprocating structure for the basket.

Fig. 6 is a generally sectional view on line 6—6 of Fig. 5.

Fig. 7 is a generally sectional view on line 7—7 of Fig. 1.

Fig. 8 is an enlarged perspective view of a cam element for operating the locking pin.

Fig. 9 is a generally sectional view on line 9—9 of Fig. 1 illustrating parts of the drive and locking mechanism.

Fig. 10 is an enlarged sectional view on line 10—10 of Fig. 9.

Fig. 11 is an enlarged sectional view on line 11—11 of Fig. 9.

Fig. 12 is a generally sectional view on line 12—12 of Fig. 9.

Fig. 13 is a diagrammatic view illustrating the travelling cover for the beakers.

Fig. 14 is a simplified diagrammatic showing of an electrical circuit for operating the device.

The device shown in the drawings has a frame 20 having base members 21, end members 22, side members 23 and top members 24 and 25, preferably having channel form (Fig. 5) to provide rails for rollers 27 supporting a carriage 28. Frame 20 supports a rectilinear array of blocks 30 recessed as at 31 for receiving the bottom portions of beakers 32 (Figs. 1 and 5). Beakers 32 are secured firmly but removably in position on blocks 30 by such means as resilient metal clamps 33 supported above the blocks by a longitudinal member 34 secured on frame 20.

An electric motor 37 anchored on frame 20 through a mount 38 drives an endless flexible element such as a roller chain 39 through such means as a belt 40, a reduction gear box 41 and associated shafts and pulleys as shown in Figs. 1 and 2. The chain extends generally the length of frame 20, is guided by idlers 42 thereon and may be properly tensioned by an idler 43 on a shiftable arm 44 biased against the chain by a stressed spring 45 secured on the frame through a bracket 46 (Fig. 3). Chain 39 engages over gear 50 journaled on a downwardly extending plate portion 51 of carriage 28 and preferably passes under an idler 52 on the plate, insuring engagement of the chain with gear 50. Gear 50 rotates axle 53 and another gear 54 thereon for driving another flexible endless element such as roller chain 55. Chain 55 drives a gear 58 having a central sleeve 59 journaled in a mount 60 projecting upwardly from the bed 61 of carriage 28 (Fig. 9). An axle 62 projects rotatably through sleeve 59 and is journaled as at 63 in another mount 64 on bed 61.

Gear 58 has axially projecting teeth 68 for dental engagement with teeth 69 on a clutch element 70 secured slidably but non-rotatably on shaft 62 by such means as a key 71 engaged within an axial keyway 72 in shaft 62. Clutch element 70 is recessed as at 73 to receive a clevis 74 on a clutch operating arm 75 shiftable transversely of the carriage by an operating handle 76. An element 80, a gear 81 and a trip lever 82 are fixed on shaft 62 as shown and are rotated thereby when teeth 68 and 69 on gear 58 and clutch element 70, respectively, are engaged.

Element 80 functions primarily as a lever but preferably has disk form as shown to facilitate manual operation of the parts as will later appear. A cam element 85 having an incline portion 86 and an adjacent depression 87 is secured to the periphery of disk 80 as by rivets 88. A locking pin 89 projects slidably through supports 90 depending from bed 61 of the carriage and is biased transversely outwardly of the carriage by a spring 91 for engagement within apertures 92 in rail 24 (Fig. 9). Pin 89 has a rigid laterally extending end portion

93 guided in a slot 94 in an element 95 on carriage bed 61 and terminating in a head or cam follower 96 for engagement with the surfaces of cam 85.

A gear 100 fixed on a shaft 101 journaled on mounts 60 is driven by gear 81 for rotating a cam 102 having throws 103 and 104 spaced generally 180° apart. Cam 102 is rotated at one half the speed of axle 62 and operates a double throw switch 105 through a cam follower 106. Switch 105 is preferably an explosion proof type of micro-switch and is arranged to open the circuit to motor 37 each time one of the shoulders on cam 102 shifts follower 106.

Carriage bed 61 supports a frame 110 with a geared pulley 111 supported on an axle 112 in its upper region. A flexible element such as a roller chain 113 engages over pulley 111 and has one end 114 connected as by pin 115 within a tube 116, forming a support for an electric motor 117 which vertically reciprocates a hook 118 from which a basket 119 for containing tissue is suspended. Motor 117 is preferably manually controlled by switch 120. The other end portion of chain 113 is secured in an eccentric position on disk 80 (Fig. 1) preferably adjacent the periphery thereof as shown at 121 so that rotation of the disk alternatively elevates and lowers motor 117 and basket 119 thereon.

Motor 117 has an annular flange 122 at its lower edge which serves as a cover plate for receptacles 32 in which basket 119 is immersed (Fig. 5). Tube 116 slides through and is guided by a channel 125 secured on frame 110 by members 126 for stabilizing the motor and basket while they are being elevated and lowered by chain 113 and carriage bed 61 has an opening 127 through which the motor and basket pass.

Trip lever 82 has an end portion 129 for engaging lugs or stops 130 on rail 25 generally oppositely disposed from locking apertures 92 on rail 24. The leading edge 131 of the trip lever is slightly offset from cam 85 (Figs. 1 and 3) for a purpose to be described. End portion 129 is connected to lever 82 through a single directional hinge 132 arranged to secure the end portion in rigid extension of lever 82 when leading edge 131 engages stops 130 and to permit end portion 129 to swing to one side when the trailing edge 133 thereof contacts stops 130.

A flexible belt 136 which may be made of a corrosion proof and water proof material such as a natural or synthetic rubber provides a travelling cover for the aligned open upper ends of beakers 32 as illustrated in Figs. 1 and 13. The cover has a single opening subjacent opening 127 in carriage bed 61 for admitting basket 119 into the subjacent beaker. This opening is preferably formed by interrupting the belt and securing its ends 137 and 138 to members 139 and 140 on the carriage. The belt is in the form of a loop extending generally the length of frame 20 and is supported and guided at the ends and bottom of the frame by rollers 141. Portions of the cover in the lower regions of the frame are protected from spillage and the like by plate 142 which supports blocks 30 (Figs. 4 and 5).

Fig. 14 illustrates in simplified form an eletcrical circuit for operating the device which includes power lines 145 with a timer or clock 146 and motor 37 in parallel, the motor circuit containing double throw micro-switch 105 and another double throw switch 147 in series therewith operated by timer 146. The timing mechanism may be housed in a conveniently accessible cabinet 148 on frame 20.

In use, a number of beakers 32 are filled with selected fluids and are snapped into clamps 33 and firmly positioned on blocks 30. Flexible cover 136 may be lifted manually so that the beakers may be slipped in under it. Beakers whose contents are to be heated are provided with heating elements whose lead-in cords 149 (Fig. 1) may be plugged into suitable outlets (not shown). The tissue to be processed is placed in basket 119 which is suspended from hook 118 and carriage 28 is manually positioned so that the basket is aligned with the open top of the beaker providing the initial bath for the tissue. Disk 80 is manually rotated to immerse the basket into the bath as shown in Fig. 5. Cam 85 and trip lever 82 are now in the positions shown generally in Figs. 1 and 3 and locking pin 89 is engaged within an aperture 92 (Fig. 9) to lock carriage 28 against movement on frame 20.

Clutch element 70 is shifted to the left as Fig. 9 is viewed by means of handle 76 for engaging teeth 69 with teeth 68 on gear 58. After timer 146 has been adjusted to close switch 147 at selected intervals, a suitable switch (not shown) is closed for actuating the timer and switch 120 is closed to actuate motor 117 for reciprocating basket 119 within beaker 132. At this time the circuit for motor 37 is open, switch 147 being in its dotted line position (Fig. 14) and switch 105 being in its solid line position. When timer 146 times out, it throws switch 147 to the solid line position, closing the circuit for motor 37 which, through gear box 41, moves chain 39 in the direction indicated by the arrows in Figs. 1 and 3. Carriage 28 is locked in stationary position on frame 20 so that movement of chain 39 rotates gear 58 through interconnecting gear 54 and chain 55.

Gear 58, through engaged clutch element 70, rotates axle 62 and disk 80 in the direction of the arrows in Figs. 1 and 3 for elevating motor 117 and basket 119 to a position above the aligned tops of beakers 32 as illustrated in Fig. 13. When basket 119 reaches this position, surface 86 of cam 85 engages head 96, forcing locking pin 89 to the right as Fig. 9 is viewed, thereby withdrawing the pin from aperture 92 in rail 24 and freeing the carriage for movement on frame 20. Head 96 snaps into depression 87 in cam 85 under the action of spring 91 at the moment when the locking pin is withdrawn from aperture 92, thereby securing disk 80 non-rotatably on carriage 28 with basket 119 in elevated position. Trip lever 82 extends generally vertically downward as illustrated in Fig. 9.

Continued movement of chain 39 now tows carriage 28 longitudinally along frame 20 until the leading edge 131 of trip lever 82 engages a stop 130, thereby turning disk 80 to force head 96 out of depression 87 and out of engagement with cam 86 so that locking pin 89 snaps into another aperture 92 again locking carriage 28 on frame 20 and freeing disk 80 for rotation. Belt 136 has shifted with the carriage to cover the beaker previously vacated by basket 119 and to uncover the beaker now aligned with the basket.

Upon resumed rotation of disk 80, basket 119 is lowered into the subjacent uncovered beaker to the position illustrated in Figs. 1 and 5. Disk 80 has now made a full revolution and cam 102 has made a half revolution so that shoulder 103 shifts cam follower 106 to throw switch 105 to its dotted line position (Fig. 14) opening the circuit for motor 37 and stopping the motion of chain 39. Opening the motor circuit sets timer 146. Motor 37, chain 39, carriage 28 and disk 80 remain stationary with basket 119 immersed in beaker 32 until timer 146 times out and throws switch 147 to its dotted line position, again actuating motor 37, whereupon the cycle repeats itself. In the meantime, motor 117 remains in operation for reciprocating basket 119 and the tissue therein in its bath in beaker 32.

The cycle continues until contents of basket 119 have been immersed in each of the desired beakers 32 and carriage 28 reaches the end of its run at which time the timer mechanism opens suitable switches for stopping operation of the device. The carriage is returned to a desired starting point by shifting clutch element 70 to the right as Fig. 9 is viewed for disengaging teeth 68 and 69 and manually rotating disk 80 to engage head 96 in recess 87 of cam 85 to unlock the carriage from the frame. The carriage is then shifted manually to the left

as Fig. 1 is viewed with end portion **129** of trip lever **82** swinging to one side on hinge **132** to pass stops **130**. Belt **136** shifts with carriage **128** in its return movement.

The processor can be installed against a wall in an out of the way position since beakers **32** can be removed and replaced and the machine can be operated conveniently with access to only one side. Moreover, since the controls and actuating mechanism are relatively simple, most of the maintenance and repairs can be accomplished from the obverse side. The relatively small number of moving parts and their relatively small size reduces whip and play of the parts to negligible proportions and facilitates precise operation. For example, in practice, using beakers of ordinary size, basket **119** is positioned with sufficient precision so that only a 32nd of an inch clearance is needed between the basket and a beaker.

The operating cycle of the machine has no beginning point and no end point as such so that the machine will operate as described no matter where the carriage or disk **80** are initially positioned. There are no controls or parts capable of getting out of phase so that the device can be left in operation unattended over long periods of time and is virtually foolproof. This characteristic plus the accurate operation described above provides for minimal breakage, repairs, maintenance and lost time.

It is important to note that during operation of the machine only that beaker aligned with the basket is uncovered at any one time, all of the other beakers remaining covered. In practice, it has been found that the precise operation of the machine permits a relatively rapid transfer of basket **119** from one beaker to another so that no beaker need be uncovered for a total time substantially exceeding one minute. Thus, the loss by evaporation of fluids in the beakers is minimal and there is little chance for dangerous concentrations of vapors to build up in the vicinity of the machine.

The device may be made to accommodate any number of beakers by merely varying its length and two or more clocks or timers may be provided to facilitate a wider selection of time intervals for bathing tissue in the various beakers.

I claim:

1. An automatic tissue processor comprising, a frame, a plurality of receptacles in generally rectilinear alignment on said frame, a carrier mounted on said frame for generally rectilinear movement adjacent said receptacles, a container for tissue on said carrier, said receptacles having openings for receiving said container, said container being shiftable for passing through said openings into and out of said receptacles, motor means, motor-actuated means operatively connected with said carrier and said container for moving the carrier and shifting the container selectively, and control means operatively connecting said motor means and said motor-actuated means to effect movement of said carrier and shifting of said container in a predetermined sequence, means normally covering said openings, and means operatively connected with said carrier operative upon movement thereof to uncover singly the openings of said receptacles for passing said container therethrough.

2. An automatic tissue processor comprising, a frame, a plurality of receptacles on said frame, a carrier mounted on said frame for movement adjacent said receptacles, a container for tissue on said carrier, said receptacles having openings for receiving said container, said container being shiftable for passing through said openings into and out of said receptacles, motor means, motor-actuated means operatively connected with said carrier and said container for moving the carrier and shifting the container selectively, and control means operatively connecting said motor means and said motor-actuated means to effect movement of said carrier and shifting of said container in a predetermined sequence, unitary means forming a cover for said openings, said cover being connected to and movable with said carrier, said cover having a single opening adjacent said container, whereby to uncover said openings singly for passing said container therethrough.

3. An automatic tissue processor comprising, a frame, a plurality of receptacles on said frame, a carrier mounted on said frame for movement adjacent said receptacles, a container for tissue on said carrier, the top ends of said receptacles being open for receiving said container, said container being shiftable for passing through said openings into and out of said receptacles, motor means, motor-actuated means operatively connected with said carrier and said container for moving the carrier and shifting the container selectively, and control means operatively connecting said motor means and said motor-actuated means to effect movement of said carrier and shifting of said container in a predetermined sequence, said top ends being generally horizontally aligned, a flexible member slidably overlying said top ends in sealing relationship with said receptacles, said member being connected to and movable by said carrier, said member having a single opening adjacent said carrier, whereby to uncover said openings singly for passing said container therethrough.

4. An automatic tissue processor comprising, a frame, a plurality of receptacles in generally rectilinear alignment on said frame, a carrier mounted on said frame for generally rectilinear movement adjacent said receptacles, a container for tissue on said carrier, the top ends of said receptacles being opened for receiving said container, means operable to shift said container in a direction generally normal to the direction of movement of said carrier for passing said carrier through said openings, motor means, motor-actuated means operatively connected with said carrier and said container for moving the carrier and shifting the container selectively, and control means operatively connecting said motor means and said motor-actuated means to effect movement of said carrier and shifting of said container in a predetermined sequence, said top ends of the receptacles being generally horizontally aligned, a flexible belt slidably overlying said top ends in sealing relationship with said receptacles, said belt being connected to and movable by said carrier, said belt having a single opening adjacent said container, whereby to uncover said top ends singly for passing said container into and out of said receptacles.

5. An automatic tissue processor comprising, a frame, a plurality of receptacles in generally rectilinear arrangement on said frame, a carrier mounted on said frame for generally rectilinear movement adjacent said receptacles, a container for tissue on said carrier, said receptacles having openings for receiving said container, said container being reciprocable for passing through the openings on receptacles aligned therewith, a motor operative to move said carrier, a rotatable element on said carrier, power transmission means operatively connecting said element to said motor wherein to impart lineal and rotatable motion to said element selectively, means operable by rotation of said element to reciprocate said container, means forming a lock releasably securing said element in stationary position relatively to said carrier, whereby to move said carrier on said frame, and means forming a release for said lock in predetermined positions of said container, whereby to move said carrier and reciprocate said container alternatively.

6. An automatic tissue processor comprising, a frame, a plurality of receptacles in generally rectilinear arrangement on said frame, a carrier mounted on said frame for generally rectilinear movement adjacent said receptacles, a container for tissue on said carrier, said receptacles having openings for receiving said container, said container being shiftable for passing through the openings on receptacles aligned therewith, a motor operative to move said carrier, means operably connecting said carrier and said motor, mechanism on said carrier operable by said means for shifting said carrier lineally and said container vertically, means forming a first lock releasably

securing said mechanism in stationary position relatively to said carrier whereby said carrier is shifted lineally, means forming a second lock releasably securing said carrier in stationary position on said frame whereby said container is shifted vertically, said mechanism including means operative to release said locks alternatively in predetermined positions of said container, whereby to move said carrier and said container alternatively.

7. An automatic tissue processor comprising, a frame, a plurality of receptacles in generally rectilinear arrangement on said frame, a carrier mounted on said frame for generally rectilinear movement adjacent said receptacles, a container for tissue on said carrier, said receptacles having openings for receiving said container, said container being reciprocable for passing through the openings on receptacles aligned therewith, a motor operative to move said carrier, a rotatable element on said carrier, power transmission means operatively connecting said element to said motor whereby to impart lineal and rotatable motion to said element selectively, means operable by rotation of said element to reciprocate said container, a locking member on said carrier, said locking member being shiftable to one position for locking said carrier in stationary position on said frame and being shiftable to another position, said locking member being positioned to be engaged and shifted by said rotatable element to said other position for releasing said carrier for movement on said frame, said locking member locking said element in stationary position relatively to said carrier when in said other position whereby said power transmission may shift said carrier lineally, and means operative to disengage said element and member for returning said member to said one position, whereby to move said carrier and reciprocate said container alternatively.

8. An automatic tissue processor comprising, a frame, a plurality of receptacles in generally rectilinear arrangement on said frame, a carrier mounted on said frame for generally rectilinear movement adjacent said receptacles, a container for tissue on said carrier, said receptacles having openings for receiving said container, said container being reciprocable for passing through the openings on receptacles aligned therewith, a motor operative to move said carrier, a rotatable element on said carrier operatively connected to said motor, means operable by rotation of said element to reciprocate said container, a locking pin on said carrier, said frame having a recess generally adjacent each receptacle, spring means biasing said pin for engagement within said recesses, whereby to lock said carrier in stationary position on said frame when said container is aligned with a receptacle, means forming a cam on said element, said cam having an incline with a depression generally adjacent thereto, means forming a cam follower on said locking pin, said incline actuating said follower to disengage said locking pin from said recesses upon rotation of said element to free said carrier for movement on said frame, said spring means biasing said follower for engagement within said depression to form a detent releasably locking said element non-rotatably on said carrier when said locking pin is disengaged, whereby to move said carrier on said frame, means forming a stop on said frame generally adjacent each receptacle, and a trip connected to said element and positioned to engage said stops for disengaging said cam and follower, whereby said locking pin engages within an aligned recess and said element is freed for rotation on said carrier.

9. The device defined in claim 8 wherein said trip swings freely in one direction for passing said stops to facilitate free manual movement of said carrier in said one direction.

10. The device defined in claim 8 wherein said means operable to reciprocate said container includes another element eccentrically connected to the first named element and to said container.

11. An automatic tissue processor comprising, a frame, a plurality of receptacles on said frame, said receptacles being adapted for containing fluids for treating tissue, a carrier on said frame, a container for tissue on said carrier, each receptacle having an opening for receiving said container, said carrier being movable on said frame to carry said container to positions adjacent said openings, said container being reciprocably mounted for entering and withdrawing from adjacent receptacles, a motor operative to move said carrier, rotary means on said carrier operably connected to said motor, means interconnecting said rotary means and container for reciprocating the latter, locking means operable by said rotary means and serving alternatively to lock said carrier to said frame in said positions and to lock said rotary means to said carrier, whereby alternatively to move said carrier and reciprocate said container for immersing tissue in said container in the contents of said receptacles successively.

12. An automatic tissue processor comprising, a frame, a plurality of receptacles in generally rectilinear arrangement on said frame, said receptacles being adapted for containing fluids for treating tissue, a carrier on said frame, a container for tissue on said carrier, each receptacle having an opening for receiving said container, said carrier being movable in a generally rectilinear path to carry said container to positions adjacent said openings, said container being reciprocably mounted for entering and withdrawing from adjacent receptacles, a motor operative to move said carrier, rotary means on said carrier operably connected to said motor, means interconnecting said rotary means and container for reciprocating the latter, locking means operable by said rotary means and serving alternatively to lock said carrier to said frame in said positions and to lock said rotary means to said carrier, whereby alternatively to move said carrier and reciprocate said container for immersing tissue in said container in the contents of said receptacles successively, switch means operatively connected with said rotary means operative to stop said motor when said container is within a receptacle, and timing means operative to start said motor after a predetermined time interval.

13. An automatic tissue processor comprising, a frame, a plurality of receptacles in generally rectilinear arrangement on said frame, said receptacles being adapted for containing fluids for treating tissue, a carrier on said frame, a container for tissue on said carrier, each receptacle having an opening for receiving said container, said carrier being movable in a generally rectilinear path to carry said container to positions adjacent said openings, said container being reciprocably mounted for entering and withdrawing from adjacent receptacles, a motor operative to move said carrier, rotary means on said carrier operably connected to said motor, means interconnecting said rotary means and container for reciprocating the latter, locking means operable by said rotary means and serving alternatively to lock said carrier to said frame in said positions and to lock said rotary means to said carrier, whereby alternatively to move said carrier and reciprocate said container for immersing tissue in said container in the contents of said receptacles successively, a cam operatively connected to said rotary means, a switch operable by said cam to stop said motor when said container is within a receptacle, and timing means operative to start said motor after a predetermined time interval.

14. The device defined in claim 13 wherein said cam is rotated at substantially one-half the speed of said rotary means and has two throws, and said switch is a double throw switch operable alternatively by the throws on said cam for stopping said motor and actuating said timer.

15. An automatic tissue processor comprising, a frame, a plurality of receptacles defining stations in generally rectilinear arrangement on said frame, said receptacles being

adapted for containing fluids for treating tissue, a carrier on said frame, a container for tissue on said carrier, each receptacle having an opening for receiving said container, said carrier being movable in a generally rectilinear path to carry said container to positions adjacent said openings, said container being reciprocably mounted for entering and withdrawing from adjacent receptacles, a motor operative to move said carrier and said container selectively, rotary drive means on said carrier, a flexible power transmission element generally co-extensive with said stations operably interconnecting said motor and said rotary drive means, means interconnecting said rotary drive means and container for reciprocating the latter, locking means operable by said inter-connecting means and serving alternatively to lock said carrier to said frame in said positions and to lock said rotary drive means against rotation, whereby said flexible element alternatively moves said rotary drive means and said carrier in a lineal direction from station to station when said rotary means is locked against rotation, and rotates said rotary drive means for immersing tissue in said container in the contents of said receptacles successively when said carrier is locked to said frame.

16. An automatic tissue processor comprising, a frame, a plurality of receptacles defining stations on said frame, said receptacles being adapted for containing fluids for treating tissue, means forming a generally continuous track on said frame adjacent said receptacles, said track extending in substantially a single plane, a carrier, a container for tissue on said carrier, each receptacle having an opening for receiving said container, said carrier being movable on said track to carry said container to positions adjacent said openings, a motor, a flexible element generally co-extensive with said station interconnecting said motor and carrier for moving said carrier on said track to said positions, said container being shiftable for entering and withdrawing from adjacent receptacles, means connected to said flexible element selectively operable lineally and rotatably to shift said carrier and container in response to movement of said flexible element by said motor, and control means coordinating said motor and the last said means for moving said carrier and shifting said container in a predetermined sequence.

17. An automatic tissue processor comprising, a frame, a plurality of receptacles in generally rectilinear arrangement on said frame, said receptacles being adapted for containing fluids for treating tissue, a support on said frame, a container for tissue on said support, each receptacle having an opening for receiving said container, said support and frame being shiftable in a generally rectilinear movement relatively to each other for transferring said containers to positions adjacent said openings, said container being reciprocably mounted for entering and withdrawing from adjacent receptacles, a motor operative to move said frame and support relatively to each other, rotary means on said support operably connected to said motor, means interconnecting said rotary means and container for reciprocating the latter, locking means operable by said rotary means and serving alternatively to lock said support to said frame in said positions and to lock said rotary means to said support, whereby alternatively to move said support and reciprocate said container for immersing tissue in said container in the contents of said receptacles successively.

18. A device for automatically transferring articles to a succession of processing stations comprising, a frame adapted for mounting adjacent the stations, a carrier mounted on said frame, said carrier being movable in generally a single plane adjacent the stations, means on said carrier forming a holder for the articles to be processed, said holder being shiftable toward and away from the processing stations, a continuous power transmission means generally co-extensive with said stations, mechanism on said carrier operable by said power transmission means for transmitting lineal motion to said carrier, means forming a lock releasably securing said carrier in stationary position relatively to said frame, said mechanism being operable to transmit rotary power from said power transmission means to move said holder on said carrier, and means forming a release for said lock in predetermined positions of said holder, whereby to move said carrier and shift said holder alternatively.

19. A device for automatically transferring articles to a succession of processing stations comprising, a frame adapted for mounting adjacent the stations, a carrier mounted on said frame, said carrier being movable in generally a single plane to carry a holder to positions adjacent the stations, means on said carrier forming said holder for the articles to be processed, said holder being reciprocable toward and away from the processing stations, continuous power transmission means generally co-extensive with said stations, rotatable means on said carrier operably connected to said transmission means, means interconnecting said rotatable means and said holder for reciprocating the latter, locking means operable by said rotary means alternatively to lock said carrier to said frame in said positions and to lock said rotatable means against rotation, said rotatable means being shiftable when in locked position in a lineal transfer motion by said power transmission means to move said carrier to the processing stations successively.

20. A device for automatically processing articles at a succession of processing stations comprising, a frame, a plurality of receptacles in generally rectilinear arrangement on said frame and positioned at the processing stations, said receptacles being adapted to contain fluids for treating articles to be processed, a carrier on said frame, a holder on said carrier for articles to be processed, each receptacle having an opening for receiving said holder, said carrier being movable in a generally rectilinear path to carry said holders to positions adjacent said stations, said holder being reciprocably mounted for entering and withdrawing from adjacent receptacles, a continuous power transmission means generally co-extensive with said stations, rotary drive means on said carrier operably connected to said power transmission means, drive means interconnecting said rotary means and container for reciprocating the latter, locking means operable by said interconnecting means alternatively to lock said carrier to said frame in said positions and to lock said rotary drive means against rotation, said power means serving to impart a lineal motion to said drive means and said carrier when said drive means is locked, and serving to rotate said drive means and reciprocate said holder for immersing articles to be processed in the contents of said receptacles successively when said carrier is locked.

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