United States Patent [19]

Peres

[11] **3,792,487**

[45] **Feb. 12, 1974**

[54] **FILM PROCESSOR**

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[73] Assignee: **Peres Electronics, Inc.**, Bristol, N.Y.

[22] Filed: **Dec. 21, 1972**

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[52] **U.S. Cl.** ..... **95/99**, 95/89 R

[51] **Int. Cl.** **G03d 3/04**

[58] **Field of Search** ..... 95/89 R, 96, 97, 98, 99

[56] **References Cited**

UNITED STATES PATENTS

3,438,317	4/1969	Merolli et al.	95/89 R X
3,437,030	4/1969	Mastrosimone et al.	95/93
2,544,644	3/1951	Allen	95/93 X
3,280,716	10/1966	Gall	95/89 R

FOREIGN PATENTS OR APPLICATIONS

1,459,755	10/1966	France	95/89 R

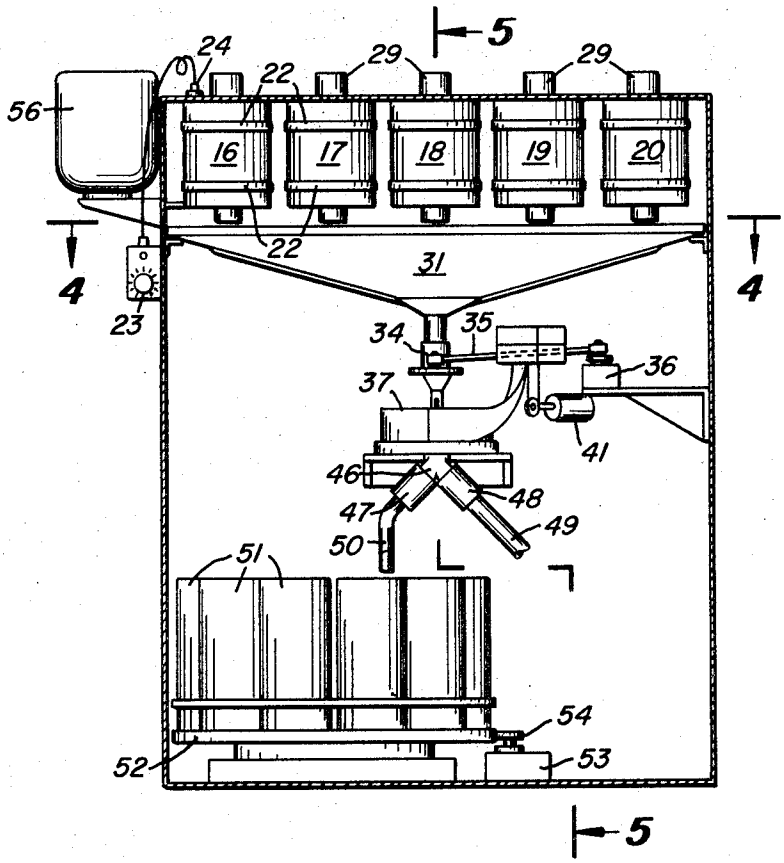
Primary Examiner—Fred L. Braun

Attorney, Agent, or Firm—George W. Shaw

[57] **ABSTRACT**

An automatic film processor has temperature-controlled containers for processing materials, solenoid-operated valves to admit the processing materials to a film-holding chamber on a timed schedule, an agitator for the film chamber, and a drain system. The operations are synchronized by a timer switch, and the machine preferably includes a driven mechanism for loading the film into the film chamber, and receptacles indexed under the drain to collect different processing materials after each step of the processing.

10 Claims, 7 Drawing Figures



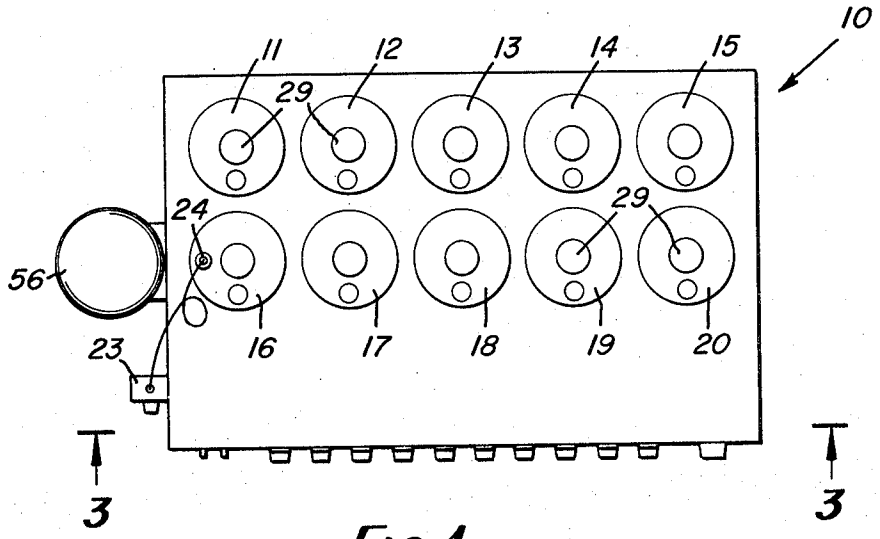

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FIG. 1.

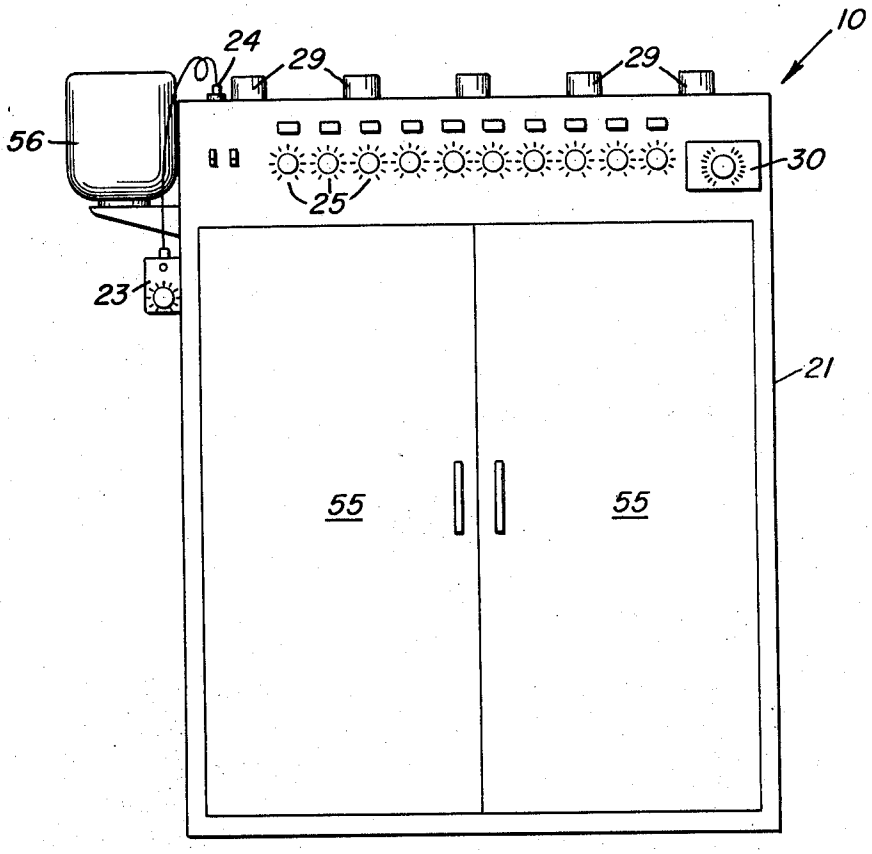

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FIG. 2.

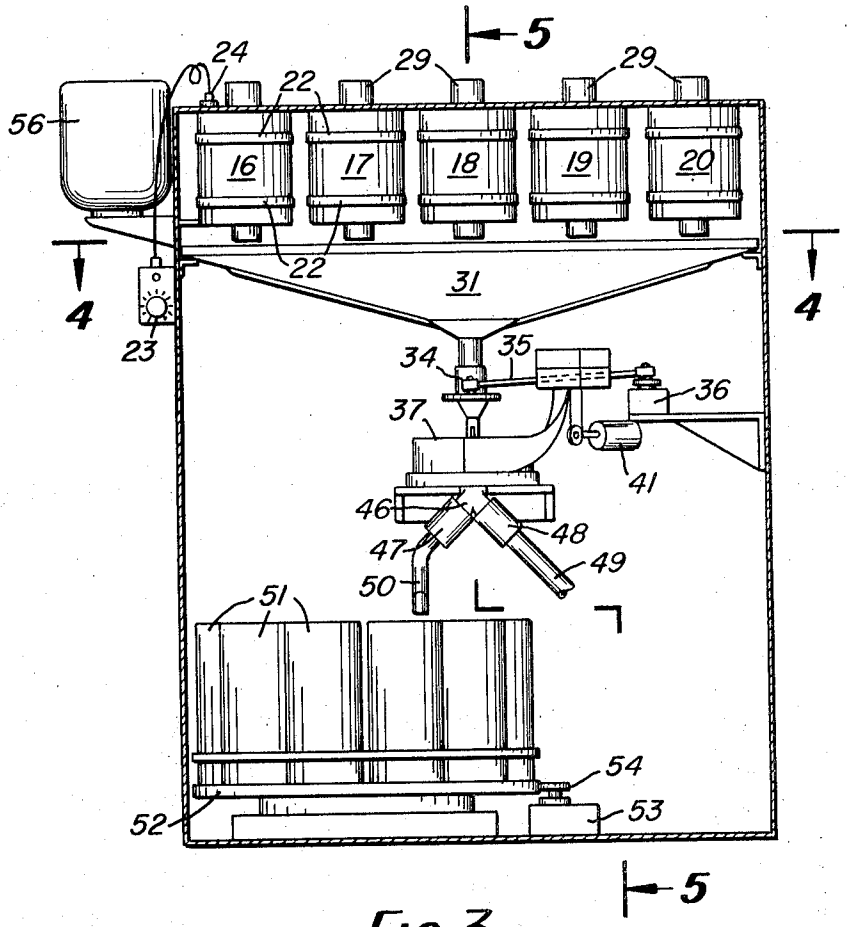

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FIG. 3.

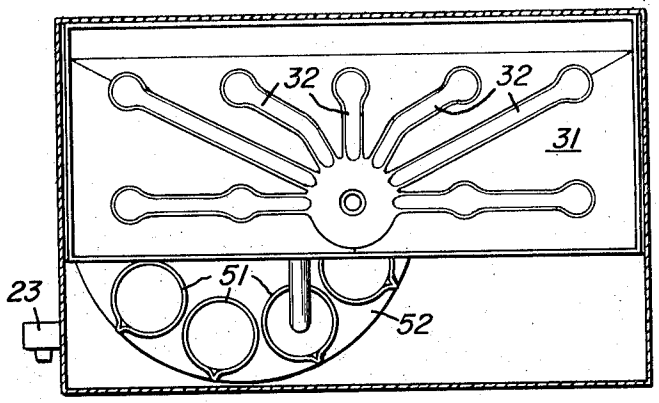

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FIG. 4.

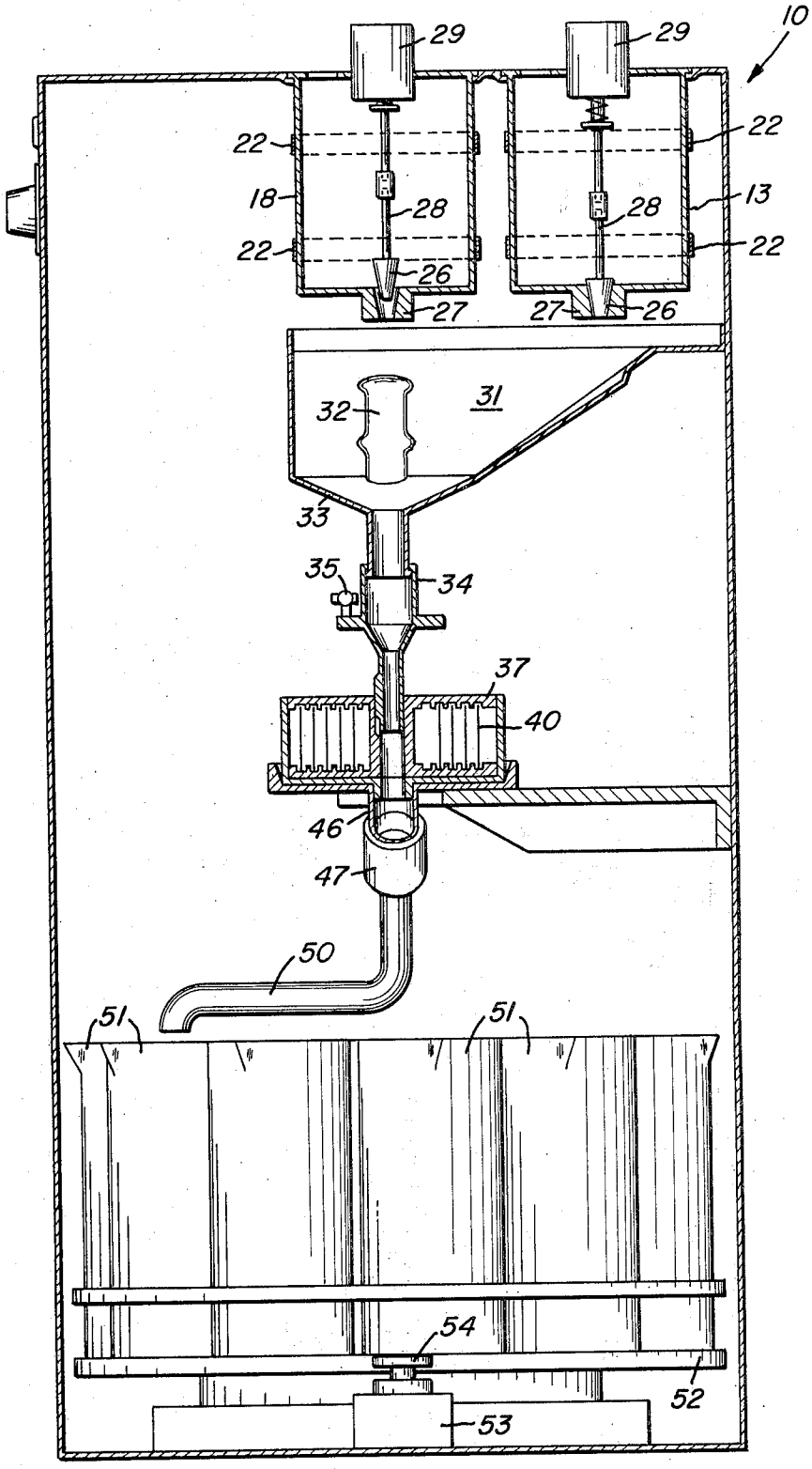

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FIG. 5.

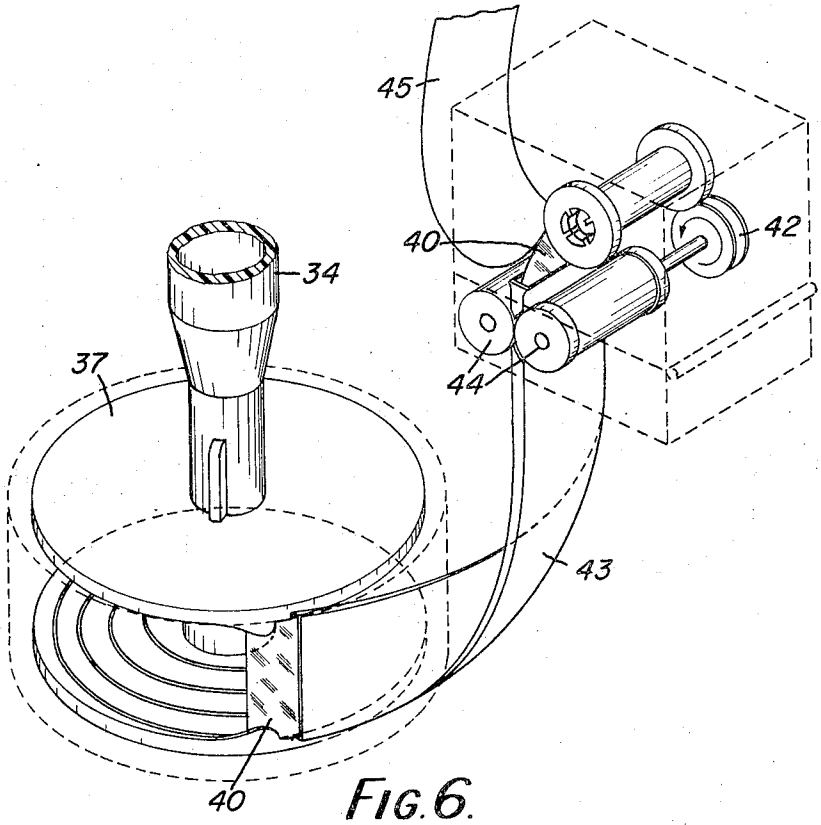

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FIG. 6.

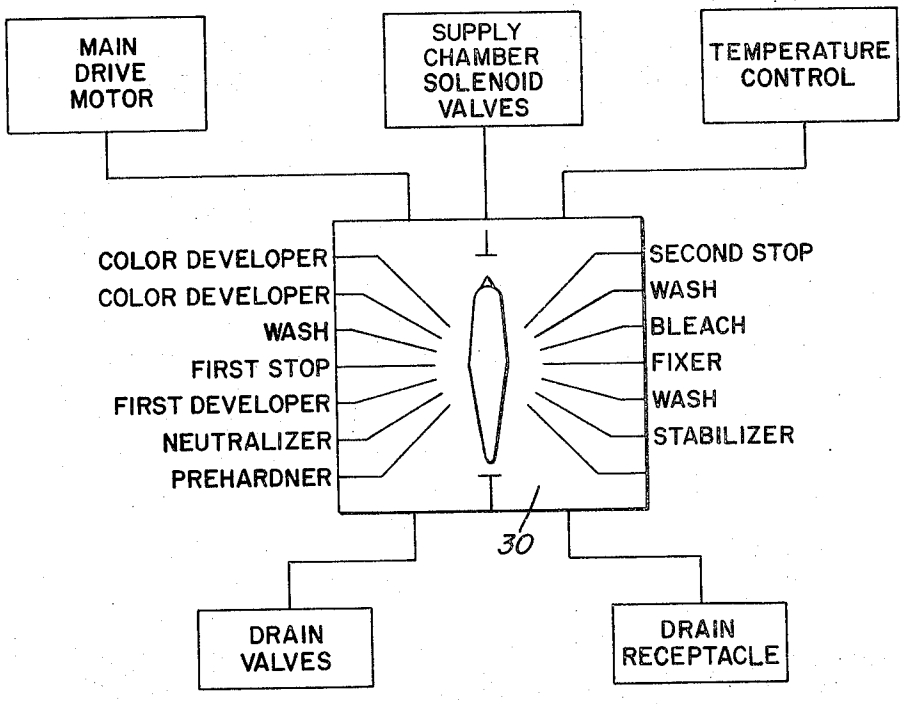

MAIN DRIVE MOTOR
SUPPLY CHAMBER SOLENOID VALVES
TEMPERATURE CONTROL
COLOR DEVELOPER
COLOR DEVELOPER
WASH
FIRST STOP
FIRST DEVELOPER
NEUTRALIZER
PREHARDNER
SECOND STOP
WASH
BLEACH
FIXER
WASH
STABILIZER
30
DRAIN VALVES
DRAIN RECEPTACLE

FIG. 7.

FILM PROCESSOR

THE INVENTIVE IMPROVEMENT

Fully automatic film processing equipment such as available for commerical installations is prohibitively expensive and large for amateur or home use. The simpler processing equipment available for home or studio use still requires considerable manual intervention and control by the operator. The invention recognizes a need for a semi-automatic or fully automatic film processor that is simple enough and inexpensive enough for home use and that still accomplishes automatic film processing for both color and black and white films without requiring much operator intervention. The invention seeks simplicity, economy, reliability, and effectiveness in a film processor that is versatile, automatic, easy to operate, convenient, compact, and feasible for home or studio use.

SUMMARY OF THE INVENTION

The inventive processor has chambers in an upper region of a cabinet for holding materials for processing film and includes a temperature control system for the chambers. A solenoid-actuated valve in the bottom of each of the chambers opens to passageways leading from the chambers to a funnel, and a film holding chamber is below the funnel to receive processing materials. An agitator drives the film holding chamber to contact the film with the processing materials, and a drain system allows drainage of the materials from the film holding chamber. All the operations are controlled by an electric timer switch having a pre-selected program.

DRAWINGS

FIG. 1 is a plan view of a preferred embodiment of the invention;

FIG. 2 is a front elevation of the embodiment of FIG. 1;

FIG. 3 is a cross sectional view of the embodiment of FIG. 1 taken along the line 3 — 3 thereof;

FIG. 4 is a cross sectional view of the embodiment of FIG. 3 taken along the line 4 — 4 thereof;

FIG. 5 is an enlarged, cross sectional view of the embodiment of FIG. 3 taken along the line 5 — 5 thereof;

FIG. 6 is an enlarged, fragmentary, perspective view of a preferred device for loading film into a film holding chamber in the inventive processor; and

FIG. 7 is a schematic diagram of the electrical operation of the illustrated embodiment.

DETAILED DESCRIPTION

The drawings illustrate various aspect of one preferred processor **10** even though many variations can be made on the same basic concepts. Processor **10** is arranged in a cabinet **21** having containers or chambers **11 – 20** in its upper region and opening at the top for filling with materials for processing photographic film. The number of chambers **20** required for any particular processing varies with the film being processed, but **10** chambers as illustrated is adequate for most color and black and white film processing operations. Each of the chambers **11 – 20** is formed as a container as best shown in FIGS. **3** and **5** and is surrounded by a ribbon heater strip **22** for controlling the temperature of the contents of each chamber. Various temperature control means are available including a single temperature controller **23** having a probe **24** sensing the temperature of one of the chambers **16** or individual temperature controllers **25** monitoring and controlling the temperature in each of the chambers **11 – 20.** Either temperature control system is preferably activated through main timer switch **30** when processor **10** is turned on.

Chambers **11 – 20** each have a bottom valve **26** that fits in a valve seat **27** and has a stem **28** operated by a solenoid **29** for opening or closing each chamber. Solenoids **29** are operated by main timer switch **30** for opening the valve **26** of any particular chamber **11 – 20** to admit its processing material to a filmstrip to be processed as described below.

A passageway pan **31** underlies chambers **11 – 20** and valves **26** and has shallow passageways **32** leading from under each valve **26** to a funnel **33.** Passageways **32** and funnel **33** are designed to drain any processing material from any chamber **11 – 20** downward with minimum residue remaining in pan **31** or funnel **33.**

A sleeve **34** is movably fitted over the bottom of funnel **33** and is driven in an arcuate reciprocal motion by connecting rod **35** from a main drive motor **36.** A film holding chamber **37** is keyed to sleeve **34** for reciprocating in an arc with sleeve **34.** Film chamber **37** has grooves for holding a coiled strip of photographic film **40,** and processing material passing down through funnel **33** and sleeve **34** fills up the inside of chamber **37** and contacts film **40** as chamber **37** is agitated by connecting rod **35.**

A drive motor **41** drives a pulley **42** that advances film **40** into chamber **37** through an input guide **43.** As best shown in FIG. **6** drive rollers **44** advance filmstrip **40** and strip off backing paper **45.** The emulsion side of filmstrip **40** preferably faces inward in chamber **37** and any backing paper **45** is removed as filmstrip **40** is fed into chamber **37.** The drive for feeding filmstrip **40** into chamber **37** can also be provided by main drive motor **36** if desired, and other means are available for loading film **40** into chamber **37.**

The drain **46** from chamber **37** is preferably Y-shaped as illustrated, and each leg of the Y is controlled by a solenoid-actuated valve **47** or **48.** Drain line **49** leads to an external sink or drain, and in simpler versions of the invention, drain line **49** and valve **48** are sufficient. Drain line **50** is used to recover and recycle processing materials that are collected in receptacle containers **51** arranged on a turntable **52** that is indexed by a motor **53** turning a friction drive roller **54** under control of main switch **30.** Containers **51** are then indexed under drain **50** as desired for collecting each processing material that is recyclable. The doors **55** of cabinet **21** can be opened to remove receptacles **51** and pour their contents back into chambers **11 – 20** as appropriate. An extra supply of rinse water is contained in chamber **56** if necessary, and water from container **56** preferably drains into pan **31** under control of main switch **30.**

As shown in FIG. **7,** main timer switch **30** controls the operations of the inventive processor. Switch **30** can be set to actuate the temperature control system through a single controller **23** or individual controllers **25** to heat the contents of chambers **11 – 20** to the desired temperature for processing film. Film is manually threaded into the film loading device and either

through main drive motor **36** or film loading motor **41** is driven into chamber **37**, preferably under control of switch **30**. Then switch **30** can be set for the processing steps desired and examples of these are indicated in FIG. **7**. The intervals for each step of the process are preferably selectively variable on sophisticated versions of the invention, but predetermined intervals can be used for most film processing. Switch **30** then runs through its preset program to open valves **26** in a prearranged sequence to admit processing materials to film chamber **37**, to agitate film chamber **37** for contact with the processing materials, and to open and close drain valves **47** and **48** as appropriate to drain away or collect each processing material. When the cycle is completed film **40** is removed from chamber **37** completely processed.

The inventive processor can process either color or black and white film and can accommodate many different sizes and types of film merely be fitting a different chamber **37** on keyed sleeve **34**. It automatically controls the proper preheating of processing materials, and all the timing and contacting of the film with materials. It also automatically drains away waste material such as rinse water and collects and saves recyclable chemicals. Also, once the processing materials are loaded into chamber **11 – 20** and the film is threaded into the loading device, processor **10** accomplishes all the remaining processing steps fully automatically. Furthermore, processor **10** is readily varied as to materials and timing of sequences and can be made simply for routine processing or more sophisticated for variations and refinements in processing procedures. Moreover, processor **10** remains simple enough and economical enough for home or studio use by amateurs or photographers whose processing work does not justify prior art automatic equipment.

Persons wishing to practice the invention should remember that other embodiments and variations can be adapted to particular circumstances. Even though one point of view is necessarily chosen in describing and defining the invention, this should not inhibit broader or related embodiments going beyond the semantic orientation of this application but falling within the spirit of the invention. For example, those skilled in the art will understand various heating systems, valve arrangements, drive mechanisms, film loaders and chambers, and drain arrangements usable within the inventive concept.

I claim:

1. A photographic film processor comprising:
a. a cabinet;
b. a plurality of chambers in said cabinet for holding liquid materials for processing said film;
c. each of said chambers having a bottom opening;
d. a plurality of valves seating respectively in said bottom openings;
e. a vertical rod extending from each of said valves up through said chambers;
f. means for raising said rods for unseating said valves for selectively opening said bottom openings;
g. a funnel below said chambers;
h. a pan having a passageway leading from each of said valves in the bottom of each of said chambers to said funnel to flow said liquid materials from said chambers to said funnel;
i. a film-holding chamber below said funnel for holding edges of said film and providing a small, liquid-holding space adjacent the emulsion surface of said film, said chamber being positioned to receive said liquid materials from said funnel; and
j. drain means for draining said liquid materials from said film-holding chamber.

2. A photographic film processor comprising:
a. a cabinet;
b. a plurality of chambers in an upper region of said cabinet for holding liquid materials for processing said film;
c. an electric heating element around each of said chambers;
d. means for energizing said heating elements for controlling the temperature of said liquid material in said chambers;
e. a solenoid-actuated valve in the bottom of each of said chambers;
f. a funnel below said chambers;
g. a pan having a passageway leading from each of said solenoid-actuated valves in the bottom of each of said chambers to said funnel to flow said heated liquid materials from said chambers to said funnel;
h. a film-holding chamber below said funnel for holding edges of said film and providing a small, liquid-holding space adjacent the emulsion surface of said film, said chamber being positioned to receive said heated liquid materials from said funnel;
i. means for agitating said film-holding chamber to contact said emulsion surface of said film with said heated liquid materials;
j. drain means for draining said liquid materials from said film-holding chamber;
k. electric timer switch means having a pre-selected program for opening and closing said solenoid-actuated valves; and
l. said drain means includes a solenoid-actuated drain valve controlled by said timer switch means in said program.

3. The processor of claim **2** wherein said temperature control means includes means for selectively and individually controlling the temperature of each of said chambers.

4. The processor of claim **2** including driven means for loading said film into said film-holding chamber.

5. The processor of claim **2** wherein said agitating means is motor driven and controlled by said timer switch means in said program.

6. The processor of claim **2** wherein said timer switch means includes means for selectively varying said program.

7. The processor of claim **2** wherein said drain means includes a plurality of receptacles for said materials and means indexed by said timer switch means in said program for sequentially positioning said receptacles under said drain valve to receive said materials.

8. The processor of claim **7** wherein said timer switch means includes means for selectively varying said program.

9. The processor of claim **8** including driven means for loading said film into said film-holding chamber and wherein said agitating means is motor-driven and controlled by said timer switch means in said program.

10. The processor of claim **9** wherein said temperature control means includes means for selectively and individually controlling the temperatures of each of said chambers.

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