Nov. 17, 1959 R. L. HISERMAN, JR 2,912,915

PHOTOGRAPHIC PROCESSING MACHINE

Filed Dec. 30, 1955 3 Sheets-Sheet 1

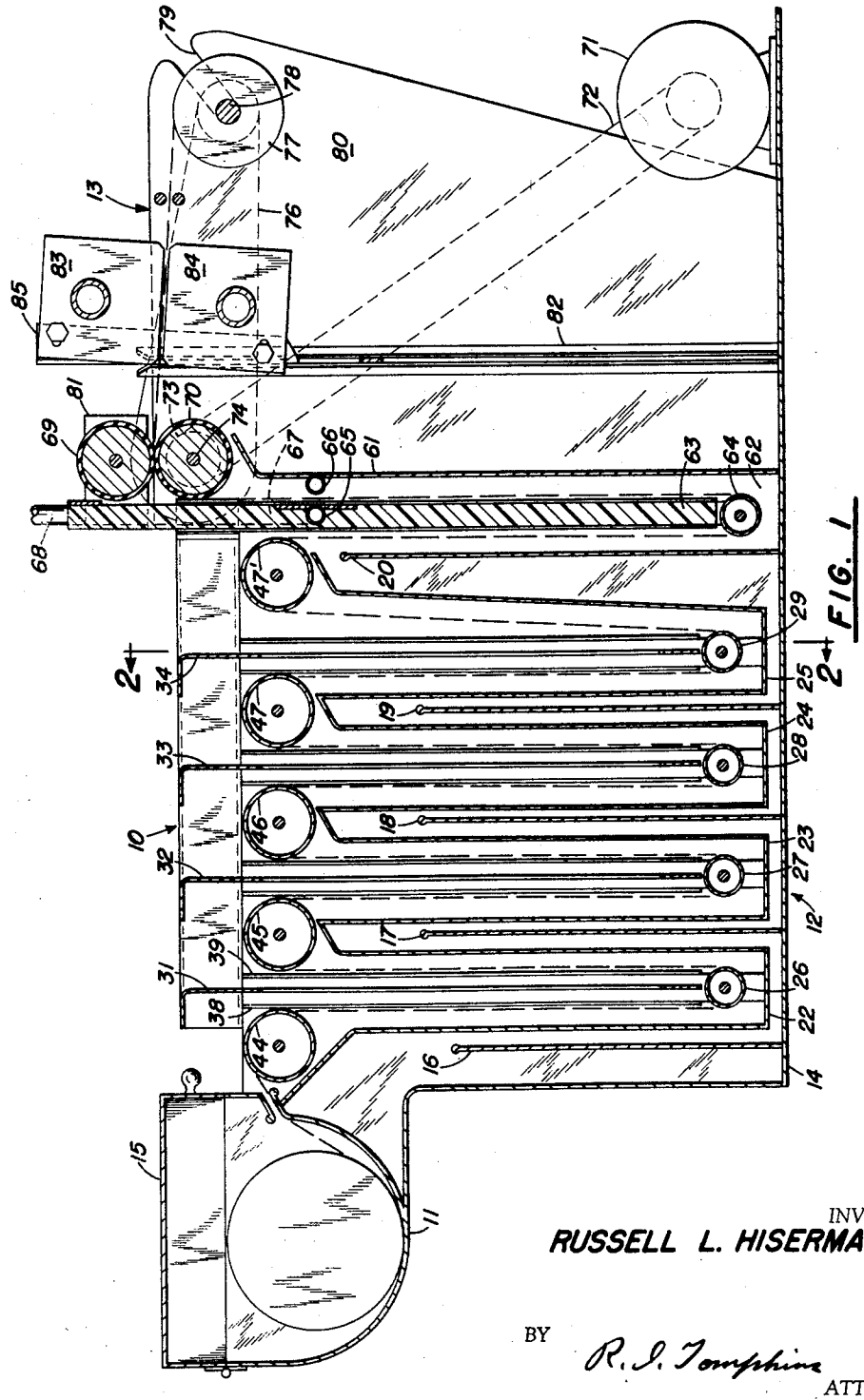


FIG. 1

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Filed Dec. 30, 1955 3 Sheets-Sheet 2

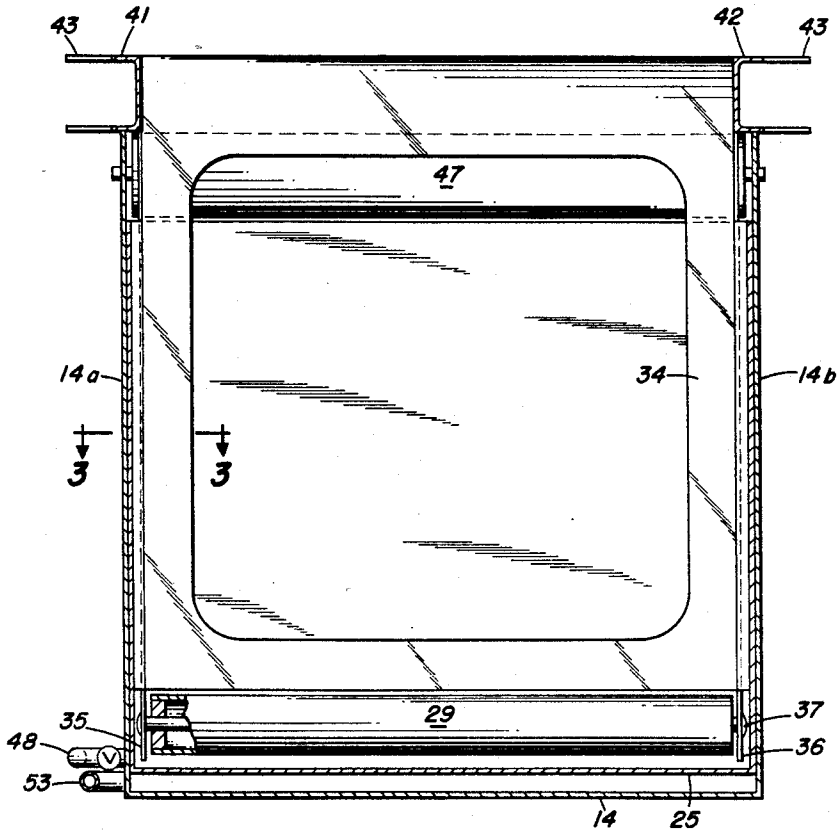


FIG. 2

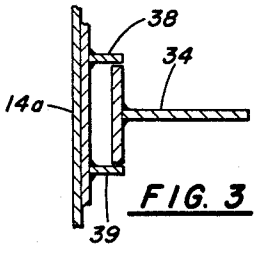


FIG. 3

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Filed Dec. 30, 1955 3 Sheets-Sheet 3

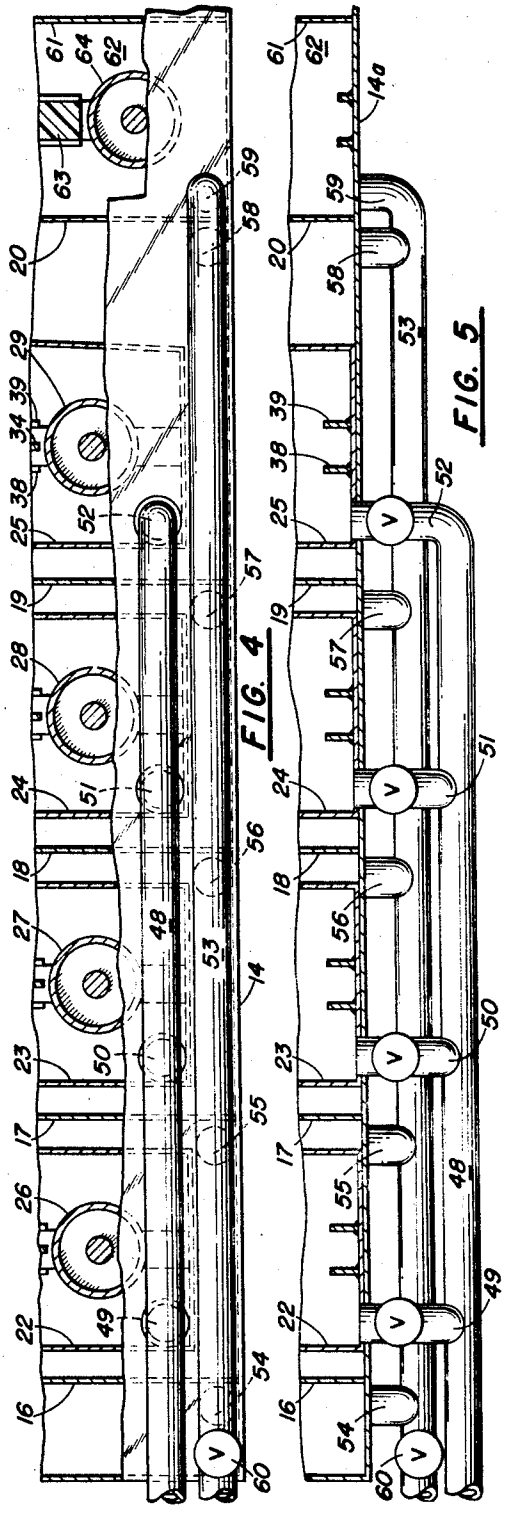


FIG. 4

FIG. 5

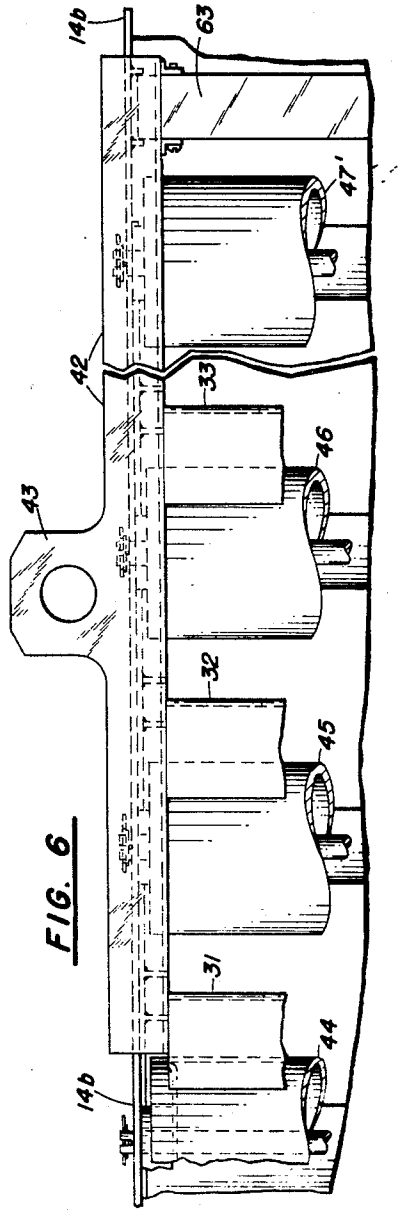


FIG. 6

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PHOTOGRAPHIC PROCESSING MACHINE

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Application December 30, 1955, Serial No. 557,219

4 Claims. (Cl. 95—94)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a photographic processing machine and more particularly to a photographic processing machine having means for readily loading the photographic film into the machine.

In the development of photographic film it has been customary to immerse the exposed negative in a plurality of baths or solutions, a minimum number of which is generally three; a developer, a fixer, and a washer. In recent years there have been attempts to provide machines to permit the automatic immersion of the photographic film in the solutions. However, these prior art machines have left much to be desired, in that they have not provided means to readily thread the film through the machines, nor have they provided for maintaining the solutions at the proper temperature, a most important step to the successful processing of the film. In addition, these machines have not provided means for readily draining the liquids from the machine when it is necessary to replace the liquids therein with fresh solutions or for purposes of cleaning the machine.

The present invention overcomes these and other deficiencies by providing a machine through which the film may be readily threaded. The present machine also provides for a circulating bath to maintain the solutions at proper temperature, provides means for draining all of the liquid from the machine, and provides a highly efficient high velocity hot air dryer to permit the drying of the film after it has passed from the last liquid bath so that it may be promptly coiled onto a storage reel.

An object of the present invention is the provision of a photographic processing machine capable of being rapidly and easily threaded with photographic film.

Another object is to provide a photographic processing machine wherein the solutions are kept at the proper temperature by the circulation of water.

A further object of the invention is the provision of means for maintaining the solutions at proper temperature without the wastage of any water or heat.

Still another object is to provide means for readily draining all liquid from the machine.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a vertical cross-sectional view of a preferred embodiment of the invention.

Fig. 2 is a cross-section taken on the line 2—2 of Fig. 1.

Fig. 3 is a detailed cross-sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a partial elevational view, partly in section, of the exterior of the machine showing the drainage connections.

Fig. 5 is a partial plan view, partly in section, of the drainage means of the invention.

Fig. 6 is a partial plan view of the roller and slide assembly of the present invention.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in the Fig. 1 a photographic film processing machine **10** including a film reel storage compartment **11**, a film processing section generally designated at **12**, and a film drying and storage section generally designated at **13**. A main chassis **14** is provided on which is mounted the film storage compartment **11** having a pivoted top member **15**. The chassis **14** has side walls **14***a* and **14***b* mounted transversely between which are a plurality of dividing walls **16**, **17**, **18**, **19** and **20**. Between the walls **16** and **17** is a tank **22**, this tank being known as the developer tank from the developer solution which it contains. Between the walls **17** and **18** there is a short stop tank **23**. Between walls **18** and **19** is a first fixer tank **24** and between walls **19** and **20** is a second fixer tank **25**.

As the photographic film must be immersed in the various solutions there are provided means to carry the film downwardly towards the bottom of each of the solution tanks, and thence upwardly out of each tank, whereby the film may be contacted with the solution for the necessary length of time. To this end there have been provided for the tanks **22**, **23**, **24**, and **25** rollers **26**, **27**, **28** and **29**, respectively. Each of these rollers is carried by a slide member, slide member **31** carrying roller **26**, slide member **32** carrying roller **27**, slide member **33** carrying roller **28**, and slide member **34** carrying roller **29**. The roller **29** and its slide member **34** may be seen in Fig. 2 wherein the slide member **34** is seen to be in the form of a hollow square made up of T numbers, as is shown in Fig. 3. The lower end of slide **34** has ears **35** and **36** thereon between which extends an axle **37**, which carries the roller **29**. The walls of each of the tanks **22**, **23**, **24** and **25** carry guide means **38**, **39** (see Fig. 3) between which the slide member associated with each of the tanks is adapted to slide.

As may be seen from Figs. 1 and 6, the four slide members are combined into a unitary assembly, together with slide plate **63**, as will be hereinafter described. This is accomplished by attaching the slide members and slide plate **63** at the upper part of their outer edges to C-channels **41** and **42** (see Fig. 2), said C-channels being provided with extensions **43** (Fig. 6) for ready manipulation.

There is also provided in the machine **10** a plurality of rollers **44**, **45**, **46**, **47** and **47′** over which the film may pass.

As may be seen from Fig. 1, each of the tanks **22**, **23**, **24** and **25** is spaced from the dividing walls **16**, **17**, **18**, **19** and **20** of the machine **10** and also from the bottom of chassis **14**. It will also be apparent that the top of dividing wall **16** is at a low elevation and the top of dividing wall **20** at a high elevation, compared to the tops of dividing walls **17**, **18** and **19**. There is thus provided a hydraulic gradient across the dividing walls.

The system for draining tanks **22**, **23**, **24** and **25** and the system for draining the water surrounding these tanks are shown in Figs. 4 and 5: a header pipe **48** has valved branch lines **49**, **50**, **51** and **52** connected through the side wall **14***a* into tanks **22**, **23**, **24** and **25**, respectively; a second header pipe **53** has branch lines **54**, **55**, **56**, **57**, **58** and **59** connected into the compartments defined by the dividing and end walls of the chassis **14**. A valve

60 is provided to control passage of water through header pipe 53.

An end wall 61 extends upwardly from chassis 14 and forms with dividing wall 20 a wash compartment 62. Slidably mounted in compartment 62, and combined with the slide members 31, 32, 33 and 34 is wash compartment slide plate 63 carrying at its lower end a roller 64 and having spray tube 65 therein slightly above the level of the top of dividing wall 20. A second spray tube 66 is mounted on end wall 61 opposite to spray tube 65. Spray tube 66 is supplied with warm water by conventional means, and spray tube 65 is supplied with warm water through a passage 67 in slide plate 63, connected to a flexible pipe 68.

Above end wall 61 there is rotatably mounted a pair of rubber covered rollers 69 and 70, roller 70 being driven by means of motor 71 which drives a belt 72 to cause rotation of a pulley 73 mounted on the shaft 74 of roller 70. Also attached to shaft 74 is a pulley which drives a belt 76 to turn take-up spool 77 in a known manner. The shaft 78 of take-up spool 77 is received in a slot 79 in opposed side walls, only one of which, side wall 80, is shown. The belt 76 may be a spring belt, thus permitting its easy removal from take up spool 77.

Roller 69 is mounted between two plates 81 carried by slide plate 63, and, with roller 70, acts as a positioning stop for slide plate 63 and roller 64 and spray tubes 65 carried thereby, and also for the slide members 31, 32, 33 and 34.

A guide standard 82 rises from chassis 14 and carries thereon a pair of identical high velocity hot air dryers 83 and 84, the dryers being secured to a mounting plate 85 which is in turn supported by standard 82 for adjustment.

In operation, water of the proper temperature is placed in the compartments around tanks 22, 23, 24 and 25 and in compartment 62. The tanks 22, 23, 24 and 25 are filled with the proper liquids. A roll of film or other exposed light sensitive medium is placed in storage compartment 11, and the four slide members 31, 32, 33 and 34 and slide plate 63 are withdrawn as a unit from the tanks and compartment 62 by holding extensions 43. One end of the film is then led out of compartment 11 and across rollers 44, 45, 46, 47 and 47', then over roller 70, through the space between the dryers 83 and 84 and threaded on the take-up spool 77, which is then placed in slot 79. Next, the unit comprising slide plate 63 and slide members 31, 32, 33 and 34 is inserted into the machine. These actions will cause the film to take the sinuous form indicated in dashed lines in Fig. 1. The controls for the motor 71 and the means for furnishing hot air to the dryers 83 and 84 are turned on, as are the water connections to the spray tubes 65 and 66. The film will thereupon be drawn through the machine by the take-up spool 77 at a rapid rate, being withdrawn from the storage compartment 11, passing successively through the tanks 22, 23, 24 and 25, and thence through the wash compartment 62. Upon leaving wash compartment 62, it is washed by the spray from spray tubes 65 and 66, subjected to the squeegee action of the rollers 69 and 70, dried by the air from the high velocity hot air dryers 83 and 84, and is then coiled, in substantially dry condition, upon take-up spool 77.

The constant efflux of water from spray tubes 65 and 66 fills wash compartment 62 and the overflow therefrom spills over dividing wall 20 into the compartment around tank 25. Thereafter, this waste water soon overflows the walls 19, 18 and 17 in succession; upon overflowing wall 16, it is led off to a drain, not shown. There is thus provided a constant flow of warm waste water into each of the compartments around the tanks 22, 23, 24 and 25, which tends to keep the liquids in said tanks at the desired temperature level.

The four tanks 22, 23, 24 and 25 may each be drained by opening the valves in the branch lines 49, 50, 51 and 52. The waste water may be drained by opening valve 60 in header 53.

Although photographic film is mentioned specifically in the specification and claims, it will be understood that the invention may be used to process other light sensitive mediums, such as oscillograph record paper.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In film processing apparatus, a chassis having a compartment, a slide plate slidably mounted in said compartment, a roller carried by said slide plate at the lower end thereof, a spray tube on said slide plate, and means for connecting said spray tube to a source of water.

2. In film processing apparatus, a chassis having a compartment, a slide plate slidably mounted in said compartment having a roller at the lower end thereof, a first spray tube on said slide plate, a second spray tube on a wall of said compartment in juxtaposition with said first spray tube, and means for connecting said spray tubes to a source of water.

3. The apparatus of claim 2, said slide plate carrying a first roller and said compartment wall carrying a second roller, said rollers cooperating to act as a limiting stop to place said spray tubes in cooperative juxtaposition when said slide plate is mounted in said compartment.

4. In film processing apparatus, a chassis, spaced side walls and end walls on said chassis, divider wall means on said chassis to provide a plurality of compartments, photographic processing solution tanks in all but one of said compartments, the tank in each compartment being of less size than said compartment whereby fluid may flow about said tank, a slide plate slidably mounted in said one compartment, a roller carried by said slide plate at the lower end thereof, a first spray tube on said slide plate, a second spray tube on a wall of said compartment in juxtaposition with said first spray tube, means for connecting said spray tubes to a source of water whereby water may be applied for washing film in said one compartment, the tops of said dividing walls being disposed so as to provide a hydraulic gradient from said one compartment downwardly across said tank-containing compartments, whereby wash liquid introduced into said one compartment will cause said compartment and said tank-containing compartments to overflow and to thereby establish a flow from said one compartment through each of said tank-containing compartments, a valved header pipe, branch lines connecting said header pipe and each of said compartments whereby said compartments may be drained, a second header pipe and valved branch lines connecting said second header pipe and each of said tanks whereby said tanks may be individually drained.

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