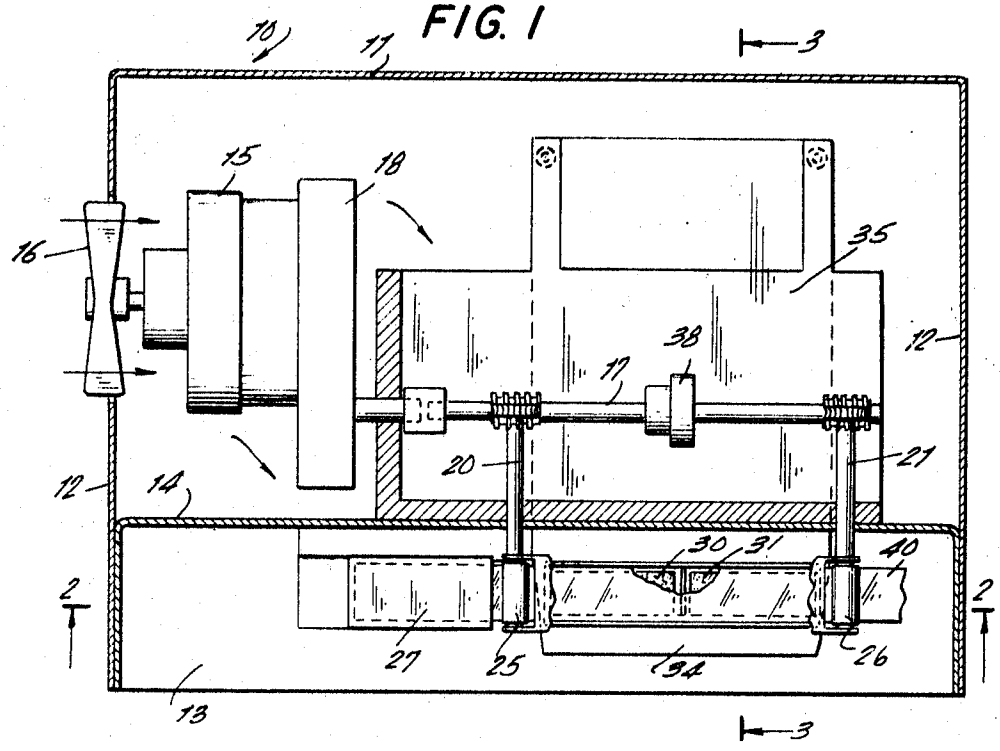
Aug. 19, 1969 W. A. PFAFF 3,461,787

MACHINE FOR DEVELOPING STRIP PHOTOGRAPHIC FILM

Filed July 8, 1966 2 Sheets-Sheet 1

FIG. 1



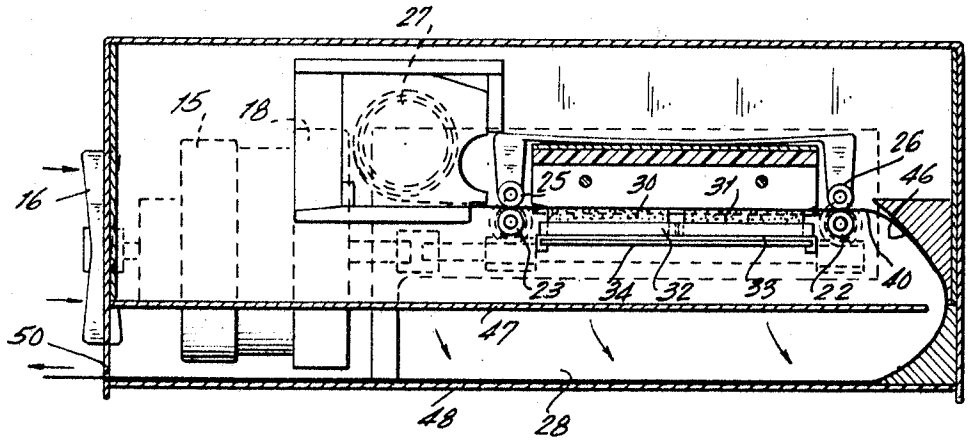


FIG. 2

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MACHINE FOR DEVELOPING STRIP PHOTOGRAPHIC FILM

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FIG. 3

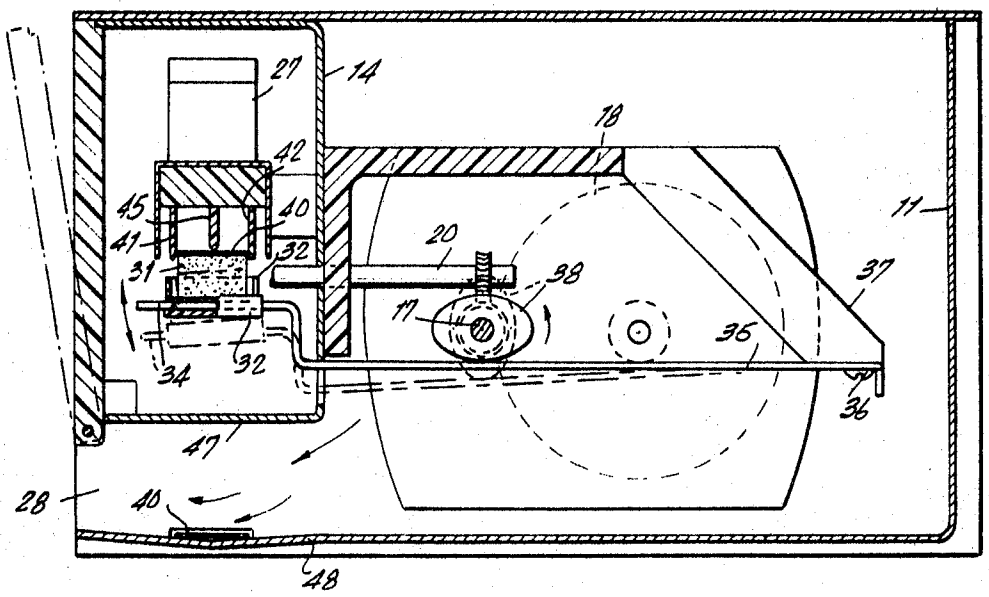


FIG. 4

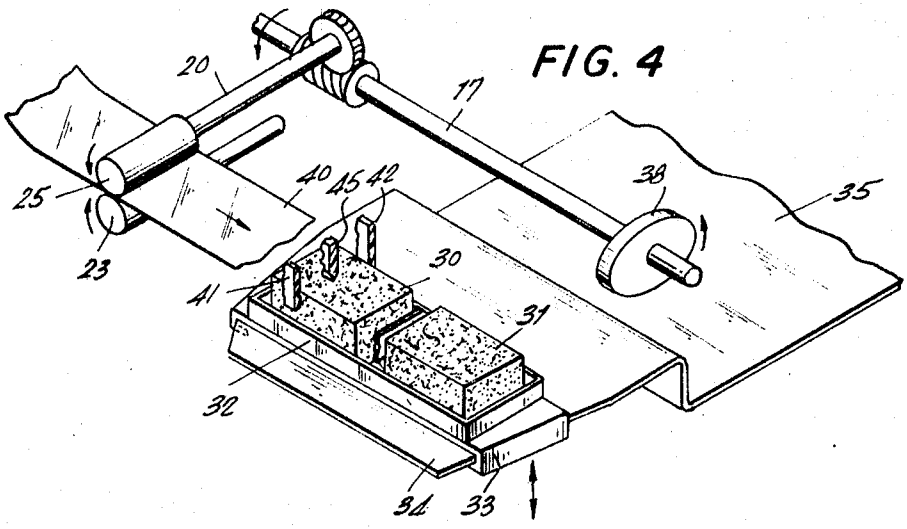
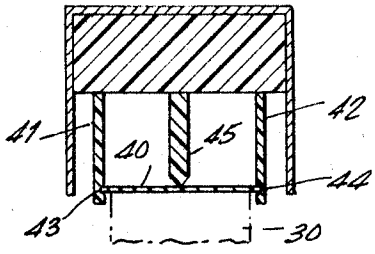


FIG. 5



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MACHINE FOR DEVELOPING STRIP PHOTOGRAPHIC FILM

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Filed July 8, 1966, Ser. No. 563,771
Int. Cl. G03d 3/12
U.S. Cl. 95—94 4 Claims

ABSTRACT OF THE DISCLOSURE

A machine for developing strip photographic film in which the film is led, emulsion side down, over a series of small trays, developing solutions and a sponge are carried in each tray. The sponge in each tray absorbs a quantity of the solution therein. As the film is advanced through the machine the sponges are alternately lifted into contact with the emulsion and removed therefrom to first apply developing solution to the emulsion and thereafter remove excess solution from the film. A constant fresh supply of solution is thus applied at each cycle.

This inventoin relates to an automatic machine for developing and fixing strip photographic film. The invention has particular reference to a small portable device which is self-threading, light in weight, and contains absorbent means which both applies and prevents the processing solutions from spilling.

Strip photographic film is generally processed in large tanks which require a "leader" strip to start the film through the tanks and around a plurality of rollers for a complete processing cycle. These tanks must be kept in a dark room to avoid fogging of the film and the entire assembly requires constant supervision. There have been some attempts to provide a small portable developing and fixing unit but these prior art devices require careful handling to keep the solution from spilling and the film from fogging.

The present invention is built so that it can be operated in daylight. It needs no leader strip and the processing fluids are held by sponge materials so that they cannot spill or mix with each other.

One of the objects of the present invention is to provide an improved apparatus for processing motion picture film which avoids one or more of the disadvantages and limitations of prior art arrangements.

Another object of the present invention is to retain processing fluids in a desired space, available for contact with an emulsion, but with no possibility of spilling.

Another object of the present invention is to move the processing fluids onto and over the emulsion surface for complete chemical action.

Another object of the present invention is to reduce the volume of processing fluids to a small fraction of the volume generally required.

Another object of the present invention is to eliminate the need for a "leader" strip to start the film through the processing stages.

Another object of the present invention is to process a strip of film by applying fluids to one side only of the strip.

Another object of the present invention is to eliminate the need for recirculating systems employing pumps and reservoirs for handling the processing liquids, and provide a disposable, low cost, easily handled processing solution supply apparatus.

Another object of the present invention is to permit the processing of very short lengths of film.

Another object of the present invention is to process exposed film in the field.

The invention comprises a film developing or stabilizing, and drying device which includes a main compartment where a film cassette holding an exposed film strip may be positioned. Adjacent to the cassette are roller means for moving the film from the cassette to a development and fixing means. The development and fixing means include one or more sponge pads which may be made of sponge rubber, plastic or the like, each of said pads having its lower portion held by a tray. The sponges are saturated with the solutions for performing the chemical operations necessary for processing the film emulsion. The trays holding the sponge pads are secured to a movable means which cyclically compresses the pads against the emulsion surface and then moves away from the surface in order to change the application of the liquid material. Additional roller means are provided for moving the processed film away from the sponge pads and into a lower chamber for drying. A motor-operated fan is employed for moving air into and out of the lower compartment in order to dry the processed film. The fan motor is also coupled to the rollers which engage the film to send it into and out of the processing chamber.

The invention consists of the construction, combination, and arrangement of parts as herein illustrated, described, and claimed.

In the accompanying drawings, forming a part hereof, there is illustrated one form of embodiment of the invention in which drawings similar reference characters designate corresponding parts, and in which:

FIGURE 1 is a plan view of the apparatus partly broken away with the top removed.

FIGURE 2 is a cross sectional view of the apparatus shown in FIGURE 1 and is taken along line 2—2 of that figure.

FIGURE 3 is a cross sectional view of the apparatus shown in FIGURE 1 and is taken along line 3—3 of that figure.

FIGURE 4 is an isometric view showing the sponge pads which apply the processing liquids to the emulsion.

FIGURE 5 is another cross sectional view showing the pad structure and the structural means above the film which hold it in place.

Referring now to the figures the developing and fixing device is enclosed within a main compartment **10** which includes side walls **11** and **12** and a side processing compartment **13** separated from the main compartment by a partition **14**. A small electric motor **15** is mounted within the main compartment **10** for turning a fan **16** and for turning a main shaft **17**, coupled through a gear reduction unit **18**. Shaft **17** is coupled to two secondary shafts **20** and **21** which turn rollers **25** and **26**. The driver rollers **25** and **26** turn driven rollers **22** and **23** to move the film from a storage cassette **27**, through the developing and fixing compartment and then out through a drying space **28**.

The processing compartment houses one or more pads **30** and **31**, each pad being supported by a tray **32** and **33**. The pads are soaked with developing and fixing solutions for wetting the film emulsion. It should be noted that there is no residual liquid in the trays, all the liquid being held by the sponge units.

The trays **32** and **33** are mounted on a flat metal portion **34** of a lever **35** (FIGURES 3 and 4) which has its end supported by a pair of screws **36** secured to a brace **37**. The base portion **35** is flexible and can be moved, as illustrated in FIGURE 3, from a normal position shown in solid lines to a lower position shown in dotted lines. This motion is provided by a cam **38** secured to main shaft **17** so that, as shaft **17** turns, the cam **38** forces the lever **35** up and down and, as a result, the pads **30** and **31** are cyclically pressed against the lower surface of the film **40**. This alternate squeezing motion forces the

processing fluids onto the surface of the film for contact with the emulsion to cause a developing or fixing action. During each cycle, when the pad trays are moved away from the film, the excess liquid is imbibed by the sponges so that there is no spilling and no liquid collects on the bottom of the tray. The alternate squeezing action produced by cam **38** provides a small local circulating action of the processing liquids so that no bubbles can collect at any spot on the emulsion to provide a pinpoint of undeveloped film, and to constantly bring fresh solution to the emulsion.

In order to insure a complete contact of the film against the pads **30** and **31** and prevent processing liquids from getting on the back of the film, supporting members **41** and **42** are provided with slots **43** and **44** formed near their lower edges. The film **40** is directed into these slots which hold the film securely against the pressure of the pads **30** and **31**, at the same time permitting a small flexing action near the central portions. A central knife-like support **45** may be added to further retain the film **40** in its flat position.

The operation of this device is evident from the description of the mechanism given above. The operator first positions the cassette **27** in the position shown with a small portion of film extending from the cassette opening. This end portion must be long enough to enter the bite of rollers **23** and **25**. Then the operator switches on the electric motor **15** by a switch which is not shown in the drawing. The motor starts to turn shafts **17**, **20**, and **21**. At the same time fan **16** starts to turn and moves air through the lower compartment **28**. Rollers **23** and **25** drive the film through the processing compartment where pads **30** and **31** apply the processing liquids to the film at the same time as cam **38** gently squeezes the pads onto and away from the surface of the emulsion.

As soon as the film leaves the rollers **22** and **26**, the film is directed downwardly by a metal guide **46** so that the film moves toward the bottom of the compartment **28** below the wall **47**. The film is then generally supported by a base panel **48**. The air flow produced by fan **16** dries the film while it moves over base **48** and by the time the film is ejected through an exit window **50** it is dry enough to be handled.

The above description is directed to an apparatus whose only function is the development, fixing, and drying of motion picture or strip film. It is obvious that this equipment can be added to a camera having the usual lens, shutter, and other components necessary for taking pictures. It should be noted, that only two or three picture frames will be overdeveloped when the camera is stopped between "takes."

While two pads are shown in the drawing, it is obvious that a sponge pad would be used where the so called "monobath" combined developer and fixer is used and that for other developing processes many more can be

added. Additional sponge pads may be used to develop color film, used with a "stop" solution to stop development, and to wash the film after it leaves the fixing bath. Also, an alcohol saturated pad may be used to increase the drying action and other solutions may be applied by similar pads to harden the emulsion.

Since the film moves through the processing mechanism at a constant speed, the apparatus can be used to develop and fix film which has been exposed to light variations other than the usual picture frames. Oscillograph beams and light spots controlled by a variety of transducers can be recorded and then developed by the present invention.

Having thus fully described the invention, what is claimed as new and desired to be secured by Letters Patent of the United States, is:

1. Apparatus for processing a strip of film having a light sensitive emulsion on one side comprising; supporting means for holding a film cassette, roller means mounted adjacent to the cassette to receive the film from the cassette along its top and bottom surfaces and direct it in a horizontal plane toward a processing means with its emulsion side down, at least one liquid tight tray beneath the film, a processing pad of sponge material mounted in each of the trays and positioned below the emulsion side of the film, vibratory means secured to said trays and adapted to cyclically move the pads against and away from the film, whereby film developing liquids in the trays and absorbed in said pads are applied to the emulsion side of the film.

2. Apparatus as claimed in claim **1** wherein said vibratory means includes a resilient mounting holding the trays and a rotary cam coupled between the resilient mounting and a motor.

3. Apparatus as claimed in claim **1** wherein said pads include at least one pad saturated with developing solution and one pad saturated with fixing solution.

4. Apparatus according to claim **1** wherein a laterally grooved supporting means is provided for slidably holding the edges of the film and permitting only the emulsion side of the film to be wetted as the film moves above the processing pads.

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