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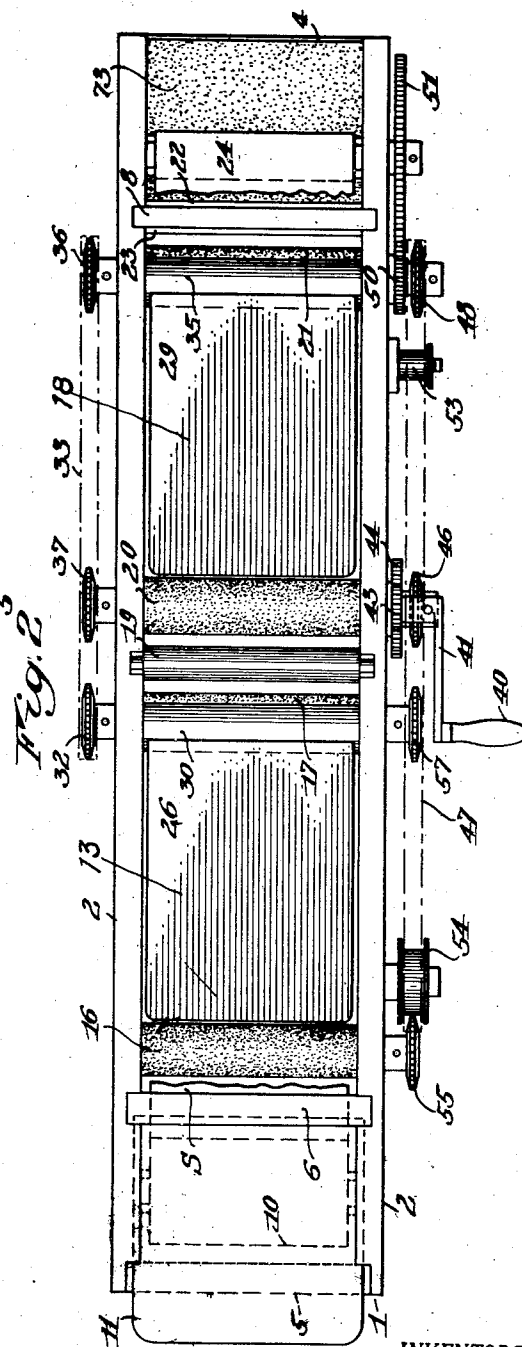
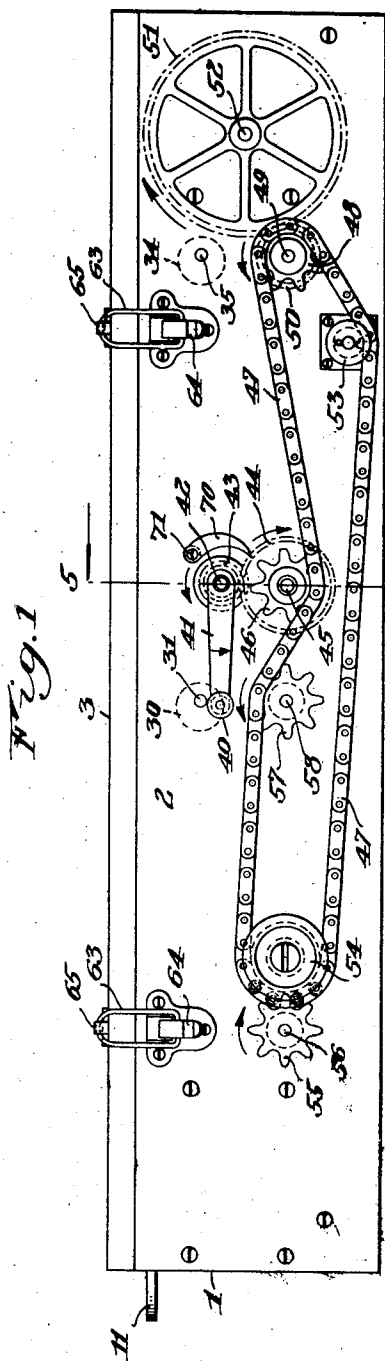
H. D. RUSSELL ET AL

2,409,153

PROCESSING APPARATUS

Filed Nov. 30, 1943

2 Sheets-Sheet 1



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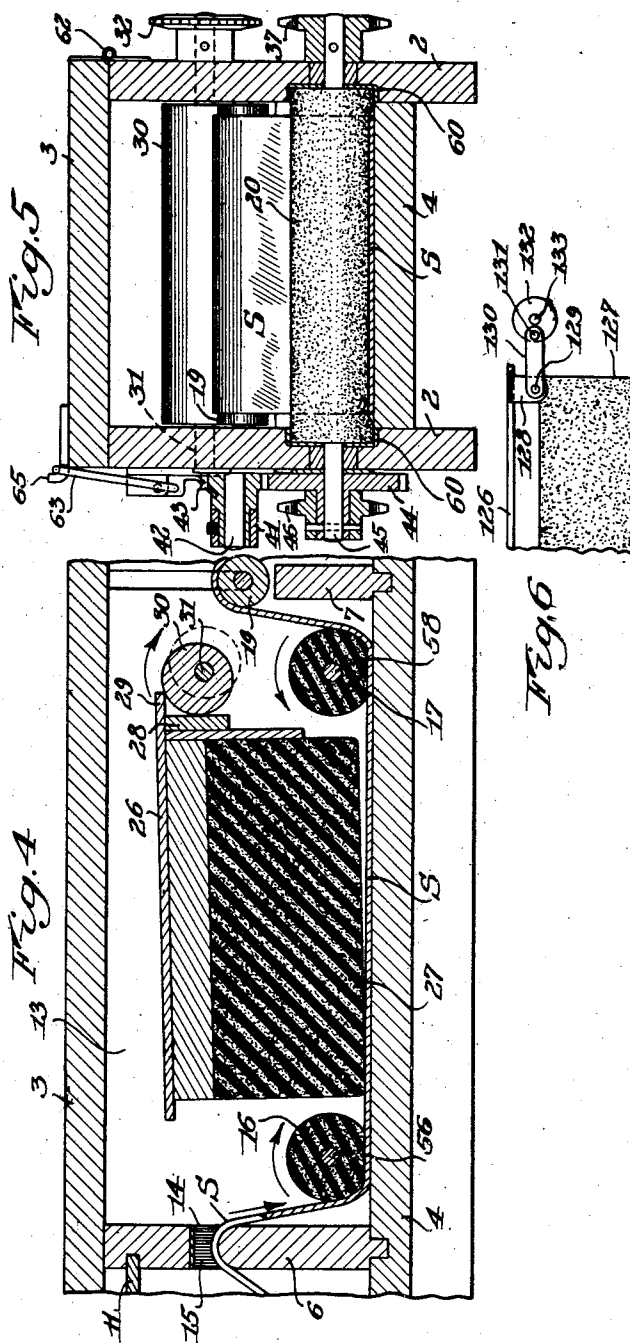
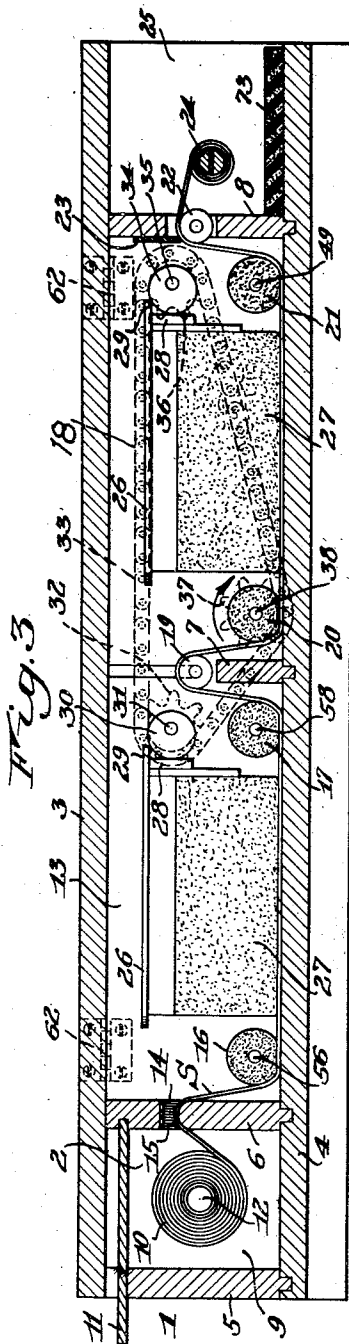
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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PROCESSING APPARATUS

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8 Claims. (Cl. 95—94)

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This invention relates to photography and particularly for a machine for processing photographic light-sensitive material such as film or paper. One object of our invention is to provide a portable processing machine in which material may be processed without the use of a darkroom. Another object of our invention is to provide a machine in which strip material may be processed by suitable fluids and a machine in which these fluids can be retained in such a manner that the machine is capable of being inverted without spilling the solutions. Another object of our invention is to provide a processing machine in which it is not necessary to provide a fluid-tight cover for the fluid treating compartments. Still another object of our invention is to provide a machine which is primarily intended for use in an airplane for processing film taken therein and paper. Other objects will appear from the following specification, the novel features being particularly pointed out in the claims at the end thereof.

At the present time most of the more compact type of processing machines for film and paper must be used with quantities of processing solution and it is usually necessary to provide a moisture-tight cover for a tank holding the solution into which the material to be processed is placed. Sometimes such tanks are provided with light-tight drains or closures through which different solutions may be introduced, but in the machines known to applicants there is almost always present a quantity of solution which must be prepared and disposed of. This is very undesirable for many purposes and particularly where sensitized material is to be processed in an airplane.

In most known types of processing machines the developing and fixing operations have been separately carried out either in different tanks or by flowing the different solutions into the same tank and most processing machines known to applicants are far too bulky to take up conveniently in an airplane.

Our improved developing machine, while particularly adapted for use in airplanes, can of course be conveniently used anywhere. It is designed, not only so that the complete machine will be light and compact, but so that a roll of film or paper can be continuously drawn through the machine and wound up in a developed, fixed or stabilized condition as an operator turns a crank on the outside of the machine. The complete operation can be carried out very rapidly with our machine and with certain preferred solutions the film may be moved 4 to 8 feet per minute.

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Coming now to the drawings wherein like reference characters denote like parts throughout:

Fig. 1 is a side elevation of a processing apparatus constructed in accordance with and embodying a preferred form of our invention;

Fig. 2 is a top plan view of the apparatus shown in Fig. 1 with the cover removed;

Fig. 3 is a longitudinal section through the tank shown in the preceding figures, certain parts being shown in elevation;

Fig. 4 is an enlarged detail section taken through one of the fluid treatment compartments;

Fig. 5 is a section taken on line 5—5 of Fig. 1; and

Fig. 6 is a fragmentary detail showing a modified form of our invention.

Our invention comprises broadly a processing apparatus in which strip material is led through the apparatus about a number of guide rollers and to a take-up roll, the guide rollers directing the film through processing compartments designed to carry the required processing solutions into contact with the sensitized surface of the strip material. By properly selecting the solutions used the operation of developing and fixing or stabilizing can be carried out continuously and a roll of film can be passed through the machine and wound up on the take-up roll in a very short period of time.

As indicated in Fig. 1, the machine may consist of an elongated box-like member 1 which includes side walls 2 and a cover 3. As indicated in Fig. 3, the elongated box 1 may also include a bottom wall 4 and upwardly extending walls 5, 6, 7 and 8. The walls 5 and 6, together with side walls 2, form a supply chamber 9 for a roll of material 10, such as film or paper, to be processed. The chamber 9, if desired, may be rendered light tight by a cover 11 which may be drawn out for the insertion or removal of a roll of sensitized material which may be mounted on centering pins 12, only one of which is shown in Fig. 3.

From the supply chamber 9 the strip material S may be led through an opening 14 which may be rendered light tight of felt or plush 15, and into the developing compartment 13. A pair of guide rollers 16 and 17 are mounted in this chamber to hold the strip material S flat against the bottom 4 of the developing compartment and the rollers 16 and 17 are preferably formed of real or artificial sponge rubber. Viscose sponge material has been found very satisfactory.

From the development compartment 13 the film may be led into a fixing compartment 18 over a guide roller 19 which may be a rigid or wooden

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roller if desired. The strip material S then passes under a pair of guide rolls 20 and 21, these rolls being preferably the same as the rolls 16 and 17 in that they are both made of soft, moisture absorbing material such as real or artificial sponges. From the fixing compartment 13 the film is led over a rigid roller 22 beneath a rubber squeezegee 23 and is wound on a take-up shaft 24 in a compartment 25 which may, if desired, be open at the end as shown in Fig. 3.

In each of the compartments 13 and 18 there are similar sponge applicators 26 which include a large block of sponge material 27. This sponge block carries a fiber plate 28 and a top plate 29 to which the sponge 27 is attached and a cam or eccentric is provided for moving each sponge. In the developing chamber 13 the cam 30 is carried by a shaft 31, this shaft supporting a sprocket 32 which may be driven by a sprocket chain 33. In the fixing compartment the cam or eccentric 34 is carried by a shaft 35 which supports a sprocket 36 also driven by the chain 33. This chain passes over a sprocket 37 carried by a shaft 38 which turns the guide roller 20 in a clockwise direction.

Thus the roller 20 and the eccentrics or cams 30 and 34 will all be turned together. Each applying sponge 27 is moved in the same manner as follows. Each time the eccentric 30 turns, the sponge block 26 is moved against the direction of movement of the film and the sponge block may be raised and lowered during this movement as indicated in Fig. 4 through the contact of the cam 30 with the fiber block 28 and the flange 29. The sponge block, since it rests on the strip material S, is normally carried along by the strip material so that the fiber block 28 will always remain in contact with the surface of the cam. As the film is moved through each of the fluid treatment chambers the sponge is stroked backwardly and forwardly over the film so as to apply an even layer of solution to the sensitized surface of the strip material. Since it is necessary to move the strip material through the machine the drive shown in Fig. 1 is employed. As indicated by this figure, there is a handle 40 on the end of a crank 41 which may be turned by an operator to turn the shaft 42. A gear 43 on this shaft turns the gear 44 on shaft 45 so as to turn the sprocket 46 in a clockwise direction. This causes a chain 47 to move as indicated by the arrows in Fig. 1 so as to turn sprocket 48 in a counterclockwise direction. Sprocket 48 is carried by a shaft 49 which turns the sponge roller 21 in a counterclockwise direction. The shaft 49 likewise carries a gear 50 for turning the large gear 51 so that its shaft 52 may turn the take-up shaft 24 on which the strip material is wound after processing. The chain 47 passes beneath an idler 53 and over a second idler 54 and also turns a sprocket 55 carried by a shaft 56. Shaft 56 turns the sponge roller 16 in a clockwise direction.

Chain 47 also passes over a sprocket 57 on shaft 58, shaft 58 turning the sponge guide roller 17 in a counterclockwise direction.

It will be noticed from the above description that the sponge rollers 16 and 20 positioned as the film enters the processing compartments turn in a direction opposite to that of the movement of the film. The reason for this is that these rollers may carry a very small quantity of the treatment fluids into smooth and even contact with the sensitized surface of the incoming film.

The sponge rollers 17 and 21 both turn in a

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counterclockwise direction to assist movement of the film and to prevent small quantities of the treatment solutions from being carried up and out of their respective compartments. It will be noticed from Fig. 4 that the sponge rollers have their shafts positioned so that they are somewhat compressed against the bottom wall 4 of the processing apparatus. The reason for this is that this compression squeezes out the treatment fluid from the rollers and tends to wipe the film without permitting the treatment solution to move out of the chamber. In fact, any small quantity of treatment fluid between the two sets of rollers 16 and 17 or 20 to 21 is confined to the space between the rollers because these rollers are not only compressed against the bottom 4 of the apparatus but each roller, as indicated in Fig. 5, is also mounted to form a substantially moisture-tight connection with the side walls 2 of the machine in the following manner. The side walls 2 are recessed and are provided with cups 60 which may be of stainless steel or other metal not affected by the processing solutions. Since the rollers tightly fit these cups and press toward the bottom 4 of the compartment, little if any moisture can leak out of the processing compartment from between a pair of guide rollers such as 16 and 17.

The sprocket 46 is carried by the shaft 45 which, in turn, is keyed to the shaft 33 so that the sprocket 37 carried thereby is turned with the sprocket 46. Thus motion may be transmitted to the chain 33 from the chain 47 so that the operator can move the film through the machine by turning the single handle 40.

If desired the cover 3 may be hingedly attached at 62 to one of the side walls 2 and we prefer to provide latches 63 operable by handles 64 to engage lugs 65 carried by the cover to hold the cover in place.

With our apparatus, as above described, the operation of developing a film or a strip of paper is extremely simple. A roll or spool of the strip material may be mounted on centering pins 12 in compartment 9 and the cover 11 may be slid on to make a light-tight connection after the end of the film has been thrust through the opening 14 and threaded about the various rollers, being finally attached to the take-up shaft 24. It is customary to provide either a separate leader strip or a leader for aerial film which is merely a continuation of the sensitized strip and which may be dyed or otherwise rendered light tight. Therefore, that portion of film or paper which threaded through the machine need not be protected from light during threading. The cover 3 is then latched in place and the operator turns the handle 40 at the required speed. A pawl 70 pivoted to the side wall at 71 prevents movement of the handle in the wrong direction. The handle is turned and the film moves slowly through the apparatus which has been previously conditioned for processing by dipping the sponge of the developing compartment 13 in the desired developing solution and by dipping the sponge of the fixing compartment 18 in the desired fixing or stabilizing solution. While both these sponges are substantially filled with solution, the solution does not flow in any quantity from the sponges as they are oscillated back and forth against the moving strip material so that each sponge applies an even layer of its solution to the sensitized surface of the strip material in a sufficient quantity to process the material but not in a sufficient quantity to permit a pool of so-

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lution which, for obvious reasons, is very undesirable for use in an airplane. The processed film may be completely wound up on the take-up shaft 24 and may then either be used in a damp condition at once or it may be passed through a suitable drier and stored for future use.

It will be noticed that any small quantities of solution which may tend to leave the development compartment 13 will be sopped up by the sponge roller 17 and the same is true in the fixing compartment 18 where the strip material must pass partially around the compressed sponge roller 21. However, any minute amounts of solution may be finally squeegeed off the surface of the strip material by means of the rubber squeegee 23 which normally presses toward the solid guide roller 22.

While we have described a preferred embodiment of our invention it is obvious that changes will readily occur to one skilled in the art. In Fig. 6 we have shown a modified means of oscillating the sponge block 25, and in this instance the sponge block may be positively moved in both directions. Here the sponge block 125 may be provided with a sponge 127. A lug 128 may be pivotally attached at 129 to a link 130 which in turn may be pivotally attached to an eccentric pin 131 carried by a disk 132 which may be attached to a shaft 133. This shaft, like shaft 31 for instance, may be driven by the sprocket 32 of Fig. 3. With this method of oscillating the sponge block, it may be made to oscillate at any desired speed with respect to the speed of movement of the film since it does not rely on the film for moving it in one direction. A sponge 13 may be provided in chamber 25 to catch possible drops of treatment solution.

Our processing apparatus, as can be seen from the above description, may be extremely compact and sufficiently light in weight to be readily portable so that an operator can rapidly process film in an airplane. It is of course obvious that such processing apparatus may be equally useful for processing films and papers wherever it is desirable to have a compact, light and portable machine suitable for use for daylight work.

We claim:

1. A fluid treating compartment for a machine for processing strip material comprising bottom, side and end walls, one of said end walls constituting a first end wall and the other of the end walls constituting a second end wall, a pair of resilient rollers, one mounted adjacent the first end wall and the other mounted adjacent the second end wall, both of said rollers pressing toward the bottom wall, power means for turning the roller adjacent the first end wall in a counter-clockwise direction and for turning the roller adjacent the second end wall in a clockwise direction, a sponge means movably mounted between the rollers and driven by said power means for turning the rollers for carrying a quantity of fluid into contact with a strip of film stretched between the rollers, said fluid being confined to the film between the rollers by the pressure of the resilient rollers against said film and towards the bottom of the treating compartment.

2. A fluid treating compartment for a machine for processing strip material comprising bottom, side and end walls, one of said end walls constituting a first end wall and the other of the end walls constituting a second end wall, a pair of resilient rollers, one mounted adjacent the first end wall and the other mounted adjacent the second end wall, both of said rollers pressing

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toward the bottom wall, power means for turning the rollers in opposite directions whereby that portion of the rollers pressing toward the bottom wall may turn in a direction away from the center of the compartment thereby tending to retain fluid therein, a sponge, a carrier for the sponge movably mounted in the compartment, power means for moving the sponge and its carrier whereby said sponge may apply a quantity of fluid to a film lying on the bottom of said compartment and pressed flat thereagainst by said rollers, said rollers and sponge tending to retain fluid between the rollers.

3. A fluid treating compartment for a machine for processing strip material comprising bottom, side and end walls, one of said end walls constituting a first end wall and the other of the end walls constituting a second end wall, a pair of resilient rollers, one mounted adjacent the first end wall and the other mounted adjacent the second end wall, both of said rollers pressing toward the bottom wall, a sponge movably mounted between the rollers, power-operated means for moving the rollers and sponge for causing the sponge to apply a quantity of solution to a film stretched between said rollers and against the bottom of the compartment to confine solution to the compartment and apply the solution evenly to the film.

4. In a machine for processing photographic strip material the combination with a housing, of a supply compartment, a development compartment, a fixing compartment and a take-up compartment arranged therein in end to end position, a plurality of guide rollers for directing the strip material through the compartments including pairs of resilient guide rollers in each end of the development and fixing compartments and mounted adjacent the bottom of said compartments, a sponge block adapted to carry treatment fluids mounted in each of the developing and fixing compartments, a drive means for moving the pairs of guide rolls in the bottoms of the developing and fixing compartment, and means also operable by the drive means for moving said sponge blocks when said guide rollers are moved to stroke a treatment fluid carried by said sponges evenly upon a strip of photographic material lying beneath the pairs of guide rollers and sponge blocks.

5. A combination according to claim 4, but wherein the rollers of each pair of rollers in the developing and fixing compartments are rotated in opposite directions away from the sponge block lying between said rollers.

6. A combination according to claim 4, but wherein the resilient rollers of each pair of rollers in the developing and fixing chamber have substantially fluid tight engagement with the walls of the developing and fixing chambers to retain fluid treatment solutions between said rollers therein.

7. A combination according to claim 4, but wherein the resilient incoming roller of each pair of rollers in the developing and fixing chambers is turned in a direction opposite to that in which the strip material is moved to evenly spread treatment fluid leaking from the said sponge block thereon before said strip material is engaged by the sponge block.

8. A fluid treating compartment for a machine for processing strip material passed through the compartment in one direction, said compartment comprising bottom, side and a first and second end wall, pairs of rollers spaced at the ends of the bottom walls, one adjacent the first end wall

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and the other adjacent the second end wall, strip material entering the compartment over the first end wall and under the roller adjacent thereto and passing from the compartment under the roller adjacent the second end wall and over the second end wall, a movably mounted fluid applying device mounted in the compartment and between the rollers, power means for operating the rollers and the movably mounted fluid applying device whereby the applied fluid may be con-

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fined between the rollers, the rollers both being resilient and mounted in the compartment with their ends compressed against the side walls and compressed against the bottom wall or strip material lying thereon to substantially prevent leakage of the fluid from the fluid treating compartment.

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