July 12, 1932. R. H. RANGER 1,867,172

PHOTOGRAPHIC STRIP FEEDING MECHANISM

Filed June 14, 1930 3 Sheets-Sheet 1

Fig. 1

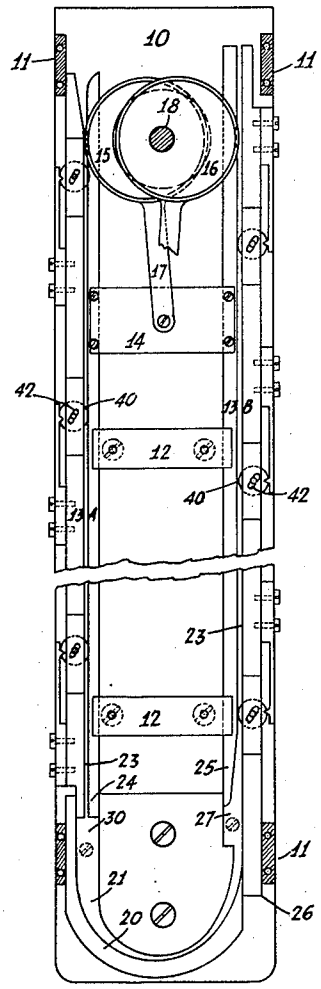
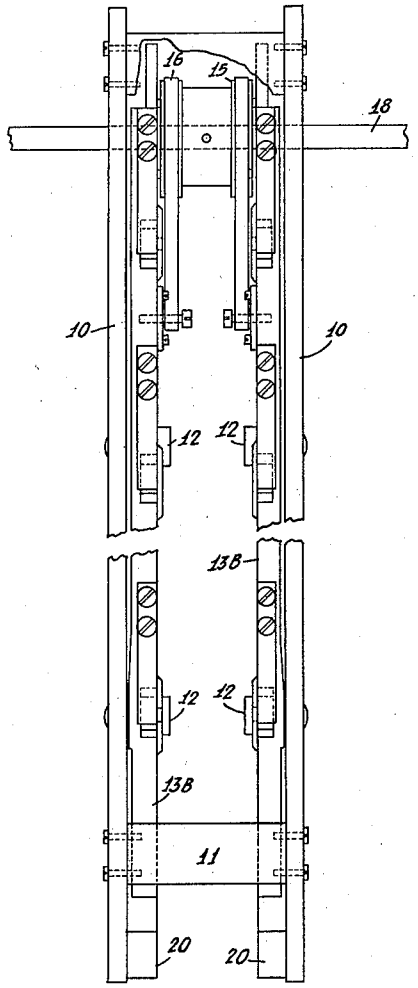


Fig. 2



INVENTOR
R. H. RANGER
BY
ATTORNEY

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PHOTOGRAPHIC STRIP FEEDING MECHANISM

Filed June 14, 1930 3 Sheets-Sheet 2

Fig. 3

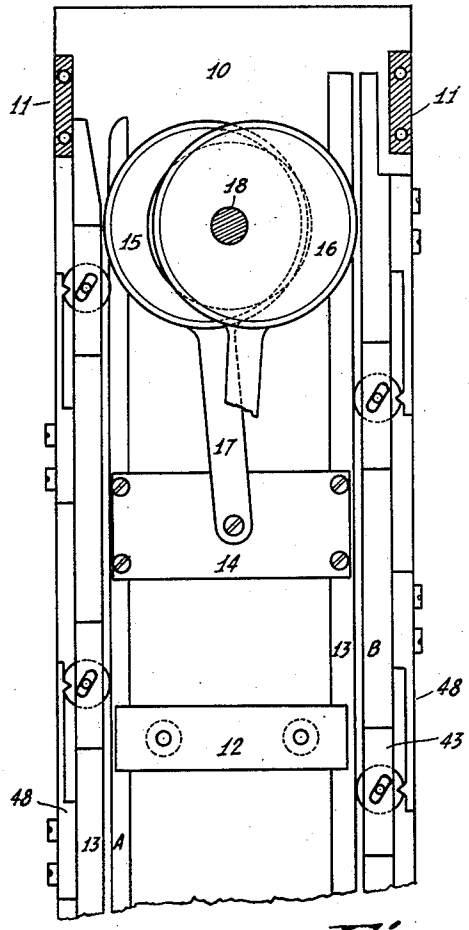


Fig. 4

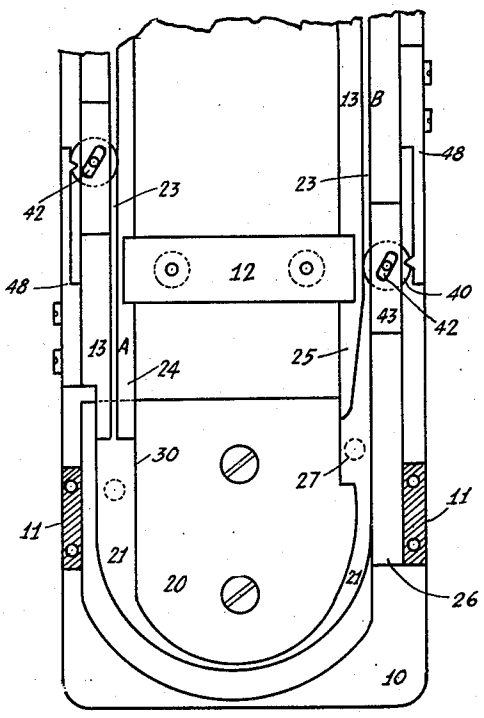


Fig. 5

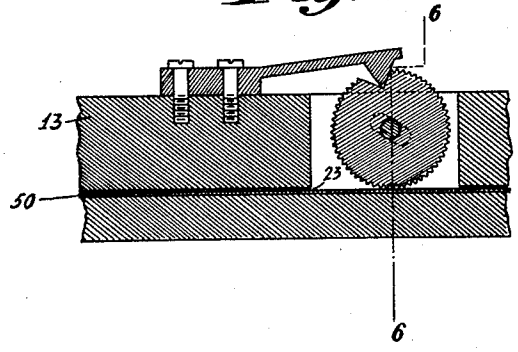
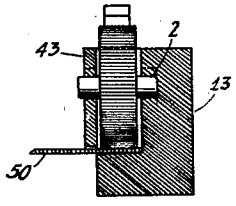


Fig. 6



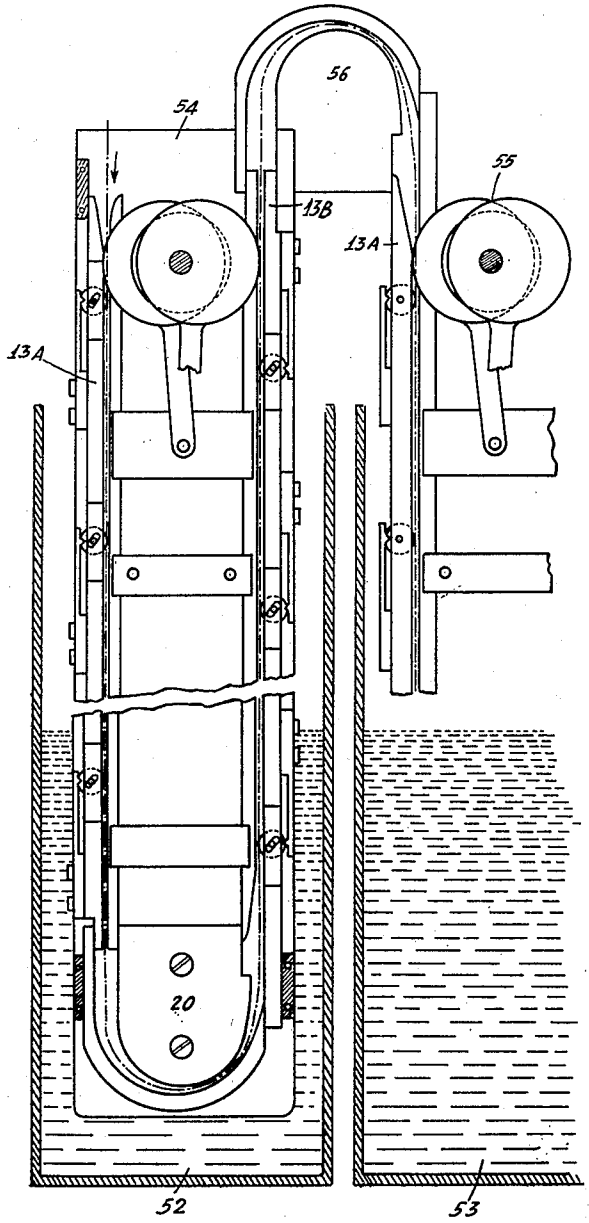
INVENTOR
R. H. RANGER
BY
ATTORNEY

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PHOTOGRAPHIC STRIP FEEDING MECHANISM

Filed June 14, 1930 3 Sheets-Sheet 3

Fig. 7



INVENTOR
R.H. RANGER
BY H. G. Grover
ATTORNEY

Patented July 12, 1932 1,867,172

UNITED STATES PATENT OFFICE

RICHARD HOWLAND RANGER, OF NEWARK, NEW JERSEY, ASSIGNOR TO RADIO CORPORATION OF AMERICA, A CORPORATION OF DELAWARE

PHOTOGRAPHIC STRIP FEEDING MECHANISM

Application filed June 14, 1930. Serial No. 461,073.

In the developing and finishing of photographic strips such as picture strips and film strips, it is necessary that the article being developed or finished be passed through a plurality of different solutions each of which tend to contribute to the complete photographic process. In the past, it has been necessary to utilize various pulleys, belts, and other strip handling mechanisms for the purpose of passing the photographic strip into and out of the various solutions. In a great many mechanisms of this type if a film break for instance, or to thread a new film or photographic strip, it is necessary to completely stop the mechanism and thread the film through the conveying or feeding mechanism by hand. These mechanisms require then that when a certain piece of photographic material has been completely operated upon, a leader or follower strip be attached to the one just finished and left in the solutions in order that the threading operation need not be repeated.

Such devices are totally unfitted for the purposes of developing and finishing short strips such as, for instance, are used in automatic camera devices wherein a series of photographs of a person is taken directly upon the medium to be later supplied to the sitter in the finished form. In these devices it is necessary that relatively short pieces of material be passed successively through a considerable number of solutions, and it is impractical to connect any sort of a leader strip with the beginning or end of the actual material constituting the photograph strip.

It is the object of this invention to provide a strip feeding mechanism particularly adapted to carry photographic strips through the individual tanks of a developing and finishing plural tank assembly.

It is a further object of this invention to provide such a strip feeding mechanism which will obviate many of the difficulties outlined above.

In other words, it is the object of this invention to provide a strip feeding mechanism wherein relatively short photographic strips may be independently passed through the individual tanks for developing and finishing the strip.

It is a further object of this invention to prevent burring or marring of the edges of the photographic strip due to contact with sprockets, etc.

Still another object of this invention is to prevent the emulsion of the photographic strip being scraped off and clogging the mechanism.

A still further and most particular object of this invention is to cause the photographic strip to have a jerky or non-continuous motion through the photographic solution, which motion will cause the solution to be jerked and thus obviate the necessity for additional agitating mechanism.

A still more particular object of this invention, in this respect, is to provide a strip feeding mechanism where the strip moving members are reciprocated and assist in agitating the solution through which the photographic strip is being passed.

Another object of this invention in this particular is to move the film or other photographic strip in a jerky manner which will eliminate streaky developing, printing, and finishing and eliminate air bubbles.

A yet further object of my invention is to provide a strip handling mechanism which will be non-corrosive under the action of the photographic solutions employed in developing and finishing photographic strips.

A still further object of my invention is to provide a strip feeding mechanism which has an extremely limited number of metallic parts which are subject to the corrosive developing and finishing solutions.

These and further objects of this invention will become apparent from the following specification taken in connection with the appended claims.

In accomplishing the objects of my invention, I provide a strip feeding device adapted to independently pass short photographic strips down into and up out of each of the successive tanks constituting the developing and finishing tank assembly of an automatic photographic machine.

Each of these strip handling mechanisms

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comprises a framework consisting of two side pieces of hard rubber or other non-corrosive substance separated by a plurality of spacers disposed at the edge thereof. Slidably secured to each of the above mentioned side pieces is a pair of feeder bars adapted to be oscillated vertically by means of an eccentric arranged on a drive shaft. The eccentric, driving each of the pairs of sliding feeder bars is arranged at 180° displacement relative to the other eccentric so that one pair of bars will be going up while the other pair is going down.

In each edge of each feeder bar, towards the opposite feeder bar of the other pair, is a slot of sufficient width to freely accommodate the edge strip being handled. The bottom of each slot is arranged from the bottom of the slot of the opposite feeder bar by a distance which is slightly more than the width of the photographic strip to be handled.

Arranged to extend into the slots in each of the feeder bars are a plurality of friction wheels which are adapted to permit the film strip to pass freely in one direction but to frictionally engage such strip and prevent it passing freely in the other direction.

The photographic strip is inserted into the channel thus provided in the two opposite feeder bars, and as the feeder bars move in opposite directions, the friction wheels on one feeder bar will engage the edge of the photographic strip and cause it to move in the direction of its motion, whereas the friction wheels in the other feeder bar will not engage. However, when the former mentioned feeder bar has reached the end of its motion in the downward direction, its friction wheels will cease engaging the picture strip. The other feeder bar, which engages the other edge of the photographic strip, will commence its downward motion, and the friction devices of this feeder bar will engage that edge of the photographic strip and cause it to continue its motion downward.

At the end of the channel provided by the two opposite feeder bars are disposed two reverser blocks secured to the side pieces of the framework. The reverser blocks are arranged in such a manner as to engage the opposite edges of the photographic strip, acting as a continuation of the channel of said feeder bars. The ends of the feeder bars act into the start of the reversing channel and the latter serves to cause the photographic strip to perform a hairpin turn and commence its upper motion under the impulse of the feeder bars which are acting upon the remainder of the photographic strip which is still engaged by them.

As the film strip emerges from the reverser, in the upward direction, it enters the channel composed of the other opposite feeder bars and is similarly engaged in this channel by a plurality of friction devices which act in exactly the same manner as those of the feeder bars just described.

The photographic strip is thus caused to come up out of the solution and a similar reversing channel may cause it to pass downward into the next solution by feeding it into the channel provided by the feeder bars of the next strip handling mechanism.

The entire strip handling mechanism thus described with the exception of the eccentric, straps, and shaft are composed of hard rubber or other non-corrosive substance and are therefore not subject to the corrosive action of any of the photographic solutions. Though not preferred the eccentric, straps, and shaft or any of them may be composed of similar non-corrosive material though a non-corrosive metal is equally satisfactory.

Having thus briefly described my invention, attention is invited to the accompanying drawings in which;

Fig. 1 represents a cross section of one unit of my strip handling mechanism;

Fig. 2 represents a side view of the same mechanism;

Fig. 3 is an enlarged cross sectional view showing more clearly the eccentric arrangement for actuating the feeder bars;

Fig. 4 is a fragmental cross section of the reverser;

Fig. 5 is a cross section of a fragment of one of the feeder bars, showing a side view of the friction wheel and the friction wheel pressure member;

Fig. 6 is an end cross sectional view of one of the feeder bars showing the friction wheel mounting, and;

Fig. 7 is a general assembly view showing the relation of two strip feeding mechanisms disposed in adjacent tanks of the developing and finishing machine.

Attention is now particularly invited to the various figures of the drawings in which similar reference figures designate like parts.

The framework consists of two side pieces 10 of hard rubber or other suitable material separated by similar separating strips 11. Secured to each side piece 10 of the frame are a plurality of T-shaped members 12 which are adapted to form between their top portion and the side pieces a channel in which the feeder bars 13 may slide. The feeder bars are arranged to operate in pairs in the channel, thus formed between the T-shaped members 12 and spacers 11. For purposes of connecting the pairs of feeder bars are provided the cross members 14. Thus it can be seen with the two feeder bars 13 which are disposed against each side piece 10 are adapted to move in unison. Their motion is caused by means of the shaft 18 which operates two eccentrics 15 and 16. Each eccentric is connected by means of the eccentric strap 17 to the appropriate connecting member 14. The two eccentrics 15 and 16 are displaced

by an angle of 180° so that as the shaft 18 rotates, the feeder bars 13 arranged against one side piece 10 will be moved by the strap 17 and the connecting member 14 in one direction, whereas the opposite feeder bars will be moved in the opposite direction by the other eccentric.

Secured against the lower end of the side pieces 10, as shown particularly in Fig. 4, are the reversing blocks 20 which are arranged to continue the channels 23 in the feeder bars 13. In accomplishing this there is provided in the block 20 a wide channel 21 into the upper portion 30 of which the small portion 24 of the feeder bar 13—A is adapted to oscillate. Similarly the portion 25 of the feeder bar B—B are adapted to oscillate in the space 27 of the block 20 and the extension 26 of the feeder bars 13—B are adapted to abut the curved portion of the passage 21 as shown particularly in Fig. 4.

Thus the edge of the film is passed through the channel 23 of the feeder bar 13—A into the channel 21 of the reversing block 20 and is bent in a reverse direction and passes between the portion 26 of the feeder bar 13—B and the portion 25 of said feeder bar, which operates in the space 27 in the block 20. It is to be noted that the portion 25 of feeder bar 13 is tapered to prevent the film from experiencing any difficulty in entering the channel 23.

In order to cause the motion of the picture strip, the feeder bars are provided with friction wheels 40 which are shown in detail in Figs. 5 and 6. These friction wheels have made integral therewith short hubs 41 which are adapted to ride in slots 42 cut into feeder bars 13 and the feeder bar friction wheel aperture covers 43. Each friction wheel 40 has a slot 47 cut in its periphery into which a hard rubber friction wheel pressure member 48 is adapted to press. These pressure members may be secured to the feeder bars 13 as illustrated in Fig. 5 or in any other appropriate manner. The pressure member 48 is adapted to keep a slight pressure on the wheel which will increase as the friction wheel rises, due to the passage of the film between it and the feeder bar. The slots 42 are cut at an angle leaning away from the feeder bar in the direction toward which the picture strip is being moved. The angle between the line of travel of the film and the center line of the slot is acute. The direction of film travel is indicated in the arrow of Fig. 2. In other words, the film is moved through the machine in the direction indicated by the arrow as when the feeder bar moves in that direction, the pressure of the friction wheel 40 upon the film 50 tends to increase and prevent slippage; whereas when the feeder bar moves in the opposite direction, the motion of the friction wheel relative to the film strip 50 tends to decrease the frictional grip of the friction wheel upon the picture strip and permits it to move relative thereto.

In other words, the force of the friction tends to keep the wheel from moving along with the bar when the feeder bar is moving in the direction opposite that indicated by the arrow, and as a consequence, it is moved up further in the slot and thus up off of the film, decreasing the pressure upon the film until it is negligible. On the other hand, suppose the feeder bar be moved in the direction indicated by the arrow, the friction of the wheel upon the film which tends to remain stationary, tends to keep the wheel from moving with the bar and as a consequence the wheel moves downward in the slot increasing the friction until it tightens its hold on the film or picture strip, and the latter is forced to move along with the bar. Thus the motion of the picture strip through the strip feeding mechanism is only in one direction, it being first pulled downward by the feeder bar which is being moved in the downward direction and then by the other feeder bar when it moves in the downward direction. The motion of each of these bars has no influence upon the picture strip to move it in other directions.

After the film is passed through the channel 21 of the reverser blocks 20 and enters the channel 23 of the feeder bars 13—B, the up moving feeder bar which grasps its edge, causes it to move upward, whereas the downward moving feeder bar exerts no influence upon it whatsoever. The strip is thus similarly moved up out of the processing solution.

Particular attention is now invited to Fig. 7 which shows an assembly comprising two tanks 52 and 53 containing various solutions through which the picture strip is to be passed. In tank 52 is arranged a film handling mechanism generally indicated at 54, and in tank 53 a mechanism generally indicated at 55, each of which mechanisms is similar to that just described. Arranged to co-act with the upper end of the feeder bars 13—B of the mechanism 54 and the feeder bar 13—A of the mechanism 55 is a reversing device 56 which is similar to the reversing device 20 previously described except its function as to change the direction of the picture strip from the upper direction to the downward direction as indicated. The ends of the feeder bars co-acting with this reversing mechanism are shaped to co-act with the reverser 56 in the same way as those co-acting with the reverser 20 previously described were shaped.

Having thus described my invention including its operation, it is to be understood that I am not to be limited by the specific embodiment shown and described for the purposes of illustration only but by the scope of

my invention as indicated in the accompanying claims.

I claim:

1. In a developing apparatus for photographic strips, a plurality of tanks, means in each tank for conveying a film in reverse directions within the tank, said means comprising oscillatory members for intermittently moving said film and stationary guiding means intermediate two tanks whereby the film from one tank may be delivered to the feeding means of the second tank.

2. In a developing apparatus for photographic strips, a plurality of tanks, means in each of said tanks for conveying the film in reverse directions therein and for carrying the film out of the tank, said means comprising a plurality of oscillatory members adapted to engage only the extreme edges of the film, and stationary guiding means intermediate two tanks for receiving the film from one tank and delivering it to another, said guiding means being adapted for only marginal contact with the film.

3. In a developing apparatus for photographic strips, means for conveying the film down into and up out of a tank comprising a plurality of oscillatory members, two of which are adapted to engage the opposite edges of the film, and are arranged to move in opposite directions at all times, and a reversing member adapted to co-act with the end of the first mentioned pair of oscillatory members to reverse the direction of the film and with a second pair of oscillatory members, which latter engage the film while moving it up out of said tank.

4. In a developing apparatus for photographic strips, means for conveying the film down into and up out of a tank including a plurality of oscillatory members, two of which are adapted to engage the opposite edges of the film, and are arranged to move in opposite directions at all times, and a reversing member, said reversing member comprising means for engaging only the marginal portions of said film.

5. In a developing apparatus for photographic strips, means for conveying the film down into and up out of a tank including a plurality of oscillatory members, each of said oscillatory members including means for frictionally engaging the film when moving in one direction only.

6. Photographic developing apparatus comprising means for passing non-continuous photographic strips through the various developing solutions including a plurality of oscillatory members arranged in pairs, each pair being adapted to engage the opposite edges of the photographic strip and one member of each pair being adapted to move in opposite directions from the other member of each pair, means arranged on said oscillatory members for frictionally engaging the photographic strip while moving in one direction and means for simultaneously moving the oscillatory members of each pair in opposite directions.

7. In a photographic developing apparatus, means for moving a non-continuous photographic strip through a finishing solution which includes means for intermittently moving the film strip and simultaneously agitating the photographic solution.

8. In a photographic developing apparatus, means for moving a non-continuous photographic strip through a finishing solution including means for intermittently moving the photographic strip to prevent the formation of bubbles thereon, and simultaneously agitating the photographic solution.

9. In a developing apparatus for non-continuous photographic strips, a strip handling mechanism including four oscillatory members, means for connecting each two of said members and operating them in unison in an oscillatory manner in opposite directions, slots in each of said oscillatory members arranged to cooperate with the slot of the opposite, oppositely moving oscillatory member to receive the opposite edges of the photographic strip, and means adapted to cooperate with said slot to cause the picture strip to be intermittently moved between the pairs of oscillatory members through the photographic solution.

10. In a developing apparatus for non-continuous photographic strips, a strip handling mechanism including four oscillatory members, means for connecting two of said members and operating them in unison in an oscillatory manner, means for connecting the other two of the said members and for moving them in an oscillatory manner in the opposite direction from the motion of said first two members, slots in each of said oscillatory members arranged to cooperate with the slot in the opposite, oppositely moving oscillatory member to receive the opposite edges of the photographic strip, means adapted to cooperate with said slots whereby the picture strip is intermittently moved between the pairs of oscillatory members, and a reversing arrangement arranged to cooperate with the ends of the first pair of oscillatory members to receive the edges of the photographic strip being passed therebetween and reverse the direction of motion of the photographic strip from the vertical downward direction to the vertical upward direction.

11. In a developing apparatus for non-continuous photographic strips, a strip handling mechanism including four oscillatory members, means for connecting two of said members and operating them in unison in an oscillatory manner, means for connecting the other two of the said members and for mov-

ing them in an oscillatory manner in the opposite direction from the motion of said first two members, slots in each of said oscillatory members arranged to cooperate with the slot in the opposite, oppositely moving oscillatory member to receive the opposite edges of the photographic strip, means adapted to cooperate with said slots to engage the edge of said photographic strip while moving in one direction only, whereby the picture strip is intermittently moved between the pairs of oscillatory members down into the photographic solution, a reversing arrangement arranged to cooperate with the ends of the first pair of oscillatory members to receive the edges of the photographic strip being passed therebetween and reverse the direction of motion of the photographic strip from the vertical downward direction to the vertical upward direction, and similar film engaging means arranged to cooperate with the slots of said second pair of oscillatory members to continue the motion of the film up out of the developing solution.

12. In a developing apparatus for non-continuous photographic strips, a strip handling mechanism including four oscillatory members, means for connecting two of said members and operating them in unison in an oscillatory manner, means for connecting the other two of the said members and for moving them in an oscillatory manner in the opposite direction from the motion of said first two members, slots in each of said oscillatory members arranged to cooperate with the slot in the opposite, oppositely moving oscillatory member to receive the opposite edges of the photographic strip, means adapted to cooperate with said slots to engage the edge of said photographic strip while moving in one direction only, said means comprising a plurality of friction members, friction member pressure means, cam surfaces so disposed that a tendency of said friction member to move relative to said oscillatory strip in one direction will cause it to frictionally engage the picture strip, whereas the tendency of said pressure member to move relative to the oscillatory member in the opposite direction will cause the pressure upon said photographic strip to be released, whereby the picture strip is intermittently moved between the pairs of oscillatory members down into the photographic solution, a reversing arrangement arranged to cooperate with the ends of the first pair of oscillatory members to receive the edges of the photographic strip being passed therebetween and reverse the direction of motion of the photographic strip from the vertical downward direction to the vertical upward direction, means to cooperate with the second pair of oscillatory members to feed the end of said photographic strip into the slots arranged in said members, and similar film engaging means arranged to cooperate with the slots of said second pair of oscillatory members to continue the motion of the film up out of the developing solution.

13. In a developing apparatus for non-continuous photographic strips, means for independently passing photographic strips through a plurality of tanks adapted to develop and finish said photographic strip, comprising in each of said tanks to strip handling mechanism including four oscillatory members, means for connecting two of said members and operating them in unison in an oscillatory manner, means for connecting the other two of the said members and for moving them in an oscillatory manner in the opposite direction from the motion of said first two members, slots in each of said oscillatory members arranged to cooperate with the slot in the opposite, oppositely moving oscillatory member to receive the opposite edges of the photographic strip, means adapted to cooperate with said slots to engage the edge of said photographic strip while moving in one direction only, said means comprising a plurality of friction members, friction member pressure means, cam surfaces so disposed that a tendency of said friction member to move relative to said oscillatory strip in one direction will cause it to frictionally engage the picture strip, whereas the tendency of said pressure member to move relative to the oscillatory member in the opposite direction will cause the pressure upon said photographic strip to be released, whereby the picture strip is intermittently moved between the pairs of oscillatory members down into the photographic solution, a reversing arrangement arranged to cooperate with the ends of the first pair of oscillatory members to receive the edges of the photographic strip being passed therebetween and reverse the direction of motion of the photographic strip from the vertical downward direction to the vertical upward direction, means to cooperate with the second pair of oscillatory members to feed the end of said photographic strip into the slots arranged in said members, similar film engaging means arranged to cooperate with the slots of said second pair of oscillatory members to continue the motion of the film up out of the developing solution, a reversing mechanism adapted to cooperate with the upper end of said second pair of oscillatory members and engage the edges of the film emerging from the first tank and direct it between the first pair of oscillatory members of a second strip handling mechanism disposed in the second tank.

14. A photographic strip feeding device including a pair of members arranged to oscillate in opposite directions, and each provided with a feed member and a resiliently supported friction member operable to

grip the film only when said feed member is moved in one direction.

15. A photographic strip feeding device including a pair of members arranged to oscillate simultaneously in opposite directions, and each provided with a feed member and a resiliently supported friction member operable to grip the film only when said feed member is moved in one direction.

16. A photographic strip feeding device including a pair of members arranged to oscillate in opposite directions, and each provided with a feed member and a resiliently supported roller operable to grip the film only when said feed member is moved in one direction.

17. A photographic strip feeding device including a pair of members arranged to oscillate in opposite directions, and each provided with a feed member and a slotted roller arranged to be forced into contact with said feed member only when it is moved in one direction.

RICHARD HOWLAND RANGER.