

[54] **AUTOMATIC FILM DEVELOPING MACHINE WITH MEANS TO SEQUENTIALLY REMOVE FILM SHEETS FROM A MAGAZINE**

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[58] Field of Search..... 214/309, 310; 250/66; 271/32

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Primary Examiner—William F. Lindquist

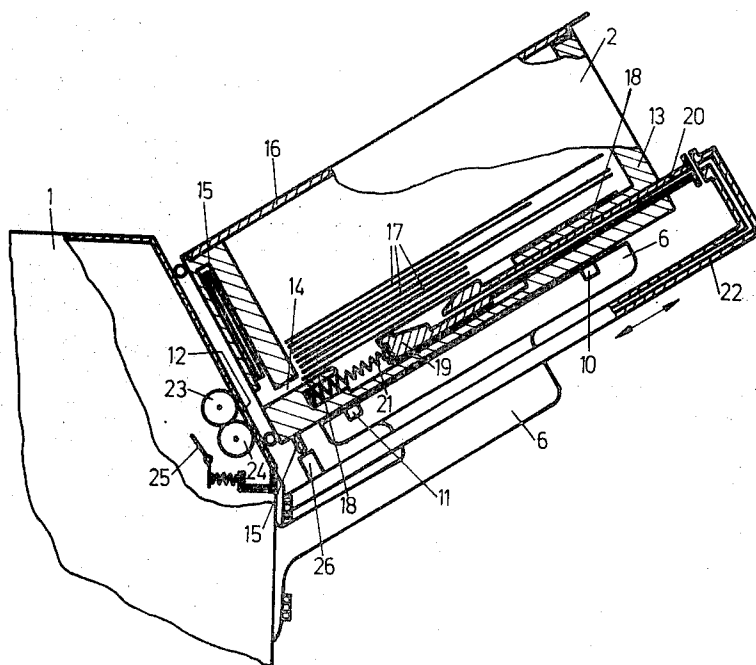
Attorney—Richards & Geier

[57]

ABSTRACT

A developing automat with an inner transportation device for sheet films, is provided with a device consisting of at least one store magazine and a holder for the magazine fixed to the automat. The invention is particularly characterized in that the supply magazine is provided with a device for removing individually film sheets located in the magazine as a pile of sheets lying directly one upon the other. The supply magazine is also provided with means actuating the film removing device by the transportation device of the automat.

4 Claims, 4 Drawing Figures



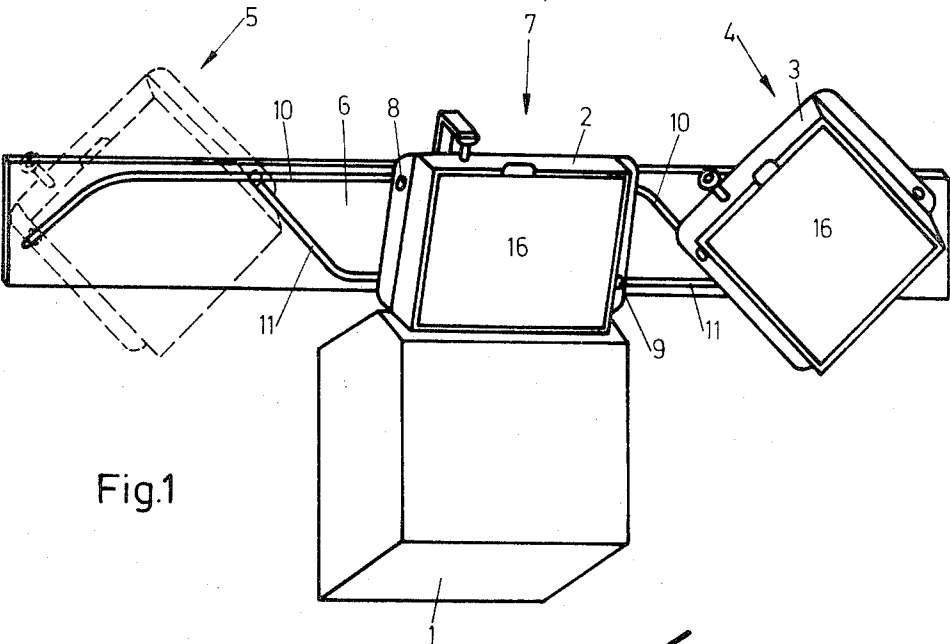


Fig.1

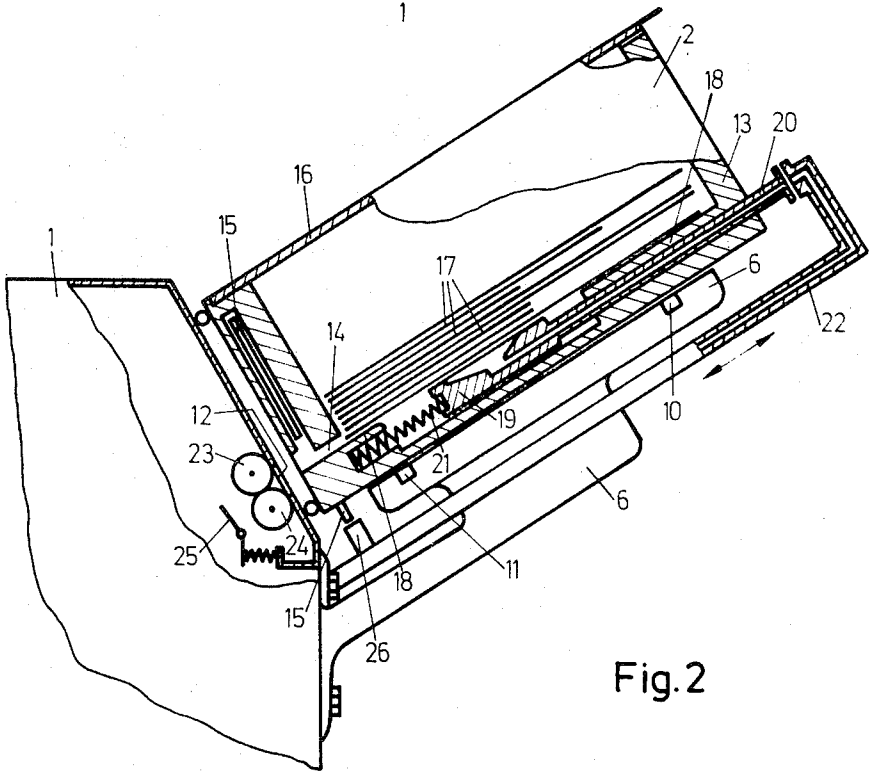


Fig.2

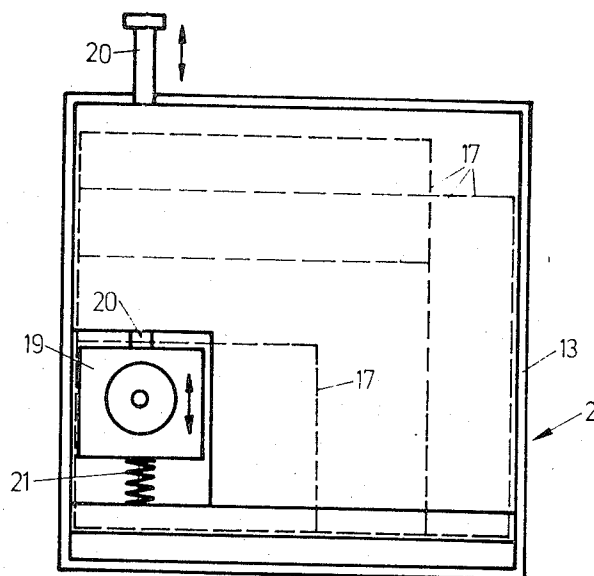


Fig. 3

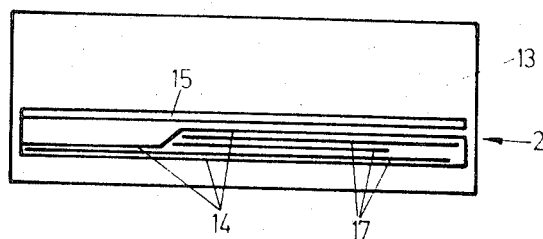


Fig. 4

AUTOMATIC FILM DEVELOPING MACHINE WITH MEANS TO SEQUENTIALLY REMOVE FILM SHEETS FROM A MAGAZINE

This invention relates to a device provided for a developing automat having inner transportation means for sheet films. The device consists of at least one store magazine and a holder for the magazine which is fixed to the automat.

Photographic films cut as sheets are used a great deal in X-ray technology. Thus the problem arises as to how to supply in a simple manner to a developing automat exposed film sheets dropping stepwise out of sheet film photographing cameras partly in slides, but at the present time more and more in receiving magazines.

In the X-ray industry a slide is used for receiving individual film sheets, which is provided with driving rollers for semi-automatically removing a film sheet after it was exposed and transporting it into a developing automat. The drawback of this construction is that each individual slide must be provided manually with a film sheet and, furthermore, each slide must be brought individually into a correspondingly adjusted developing automat for developing the exposed film sheet. When the developing automat is full one worker is needed to remove the film sheets from the dropping out slides.

A device is also known wherein loose film sheets are introduced automatically into an automatic developing machine provided with an inner film sheet transporting device. The drawback of this construction is that the developed films must be stuck one after the other into the spaces of a fan-like magazine.

An object of the present invention is to eliminate these drawbacks of existing constructions.

Other objects will become apparent in the course of the following specification.

In the accomplishment of the objectives of the present invention it was found desirable to combine a developing automat having an inner transportation device with a supply magazine having a device for removing individually film sheets located in the magazine as a pile and means operating the film removing device by the film transportation device of the developing automat. This makes it possible to remove in a single operation the entire batch of sheet films to be developed located in a film receiving slide of an X-ray examining device and to bring it as a batch into the supply magazine without it being necessary to place the individual sheet separately. These film sheets then can be removed automatically by the developing automat corresponding to its treating speed. Thus all means for adapting the operating speed of the development automat to the removing device are eliminated.

According to an advantageous further embodiment of the present invention the device for removing individual film sheets in the plane of the supporting surface of the film sheets can consist of an at least partly calibrated removing slit and a suction head extending into the same plane and movable back and forth in the direction toward the calibrated slit. This makes it possible to also remove flat unperforated films from a pile of film sheets lying directly one on top of the other. This removing device has also the advantage that supporting pressure between the sheets can be maintained small.

The insertion capacity of the device can be further substantially increased if the holder is so constructed that the store magazine can be transported into a so-

called charging position for being charged with films of different sizes. In this position the supporting surface for the film sheets in the store magazine is inclined by at least 25° to the horizontal and has its inclination maximum approximately along its diagonal; in it the calibrated part of the removing slit is arranged upon a side of the slit while the suction head is arranged in the corner of the magazine assuming the lowest location in the charging position. This construction of the holder provides that when the store magazine is supplied with a pile of films of different sizes, all films will have a definite position in the magazine. This spatial arrangement also provides that even when films of different sizes are arranged in the pile in any possible sequence, only that film sheet which is located directly at the removing device will be sucked in and transmitted through the removing slit. Furthermore, in this arrangement the surface of the suction head used for shifting the film sheets is located centrally relatively to the calibrated part of the slit, so that the bending of the edges of the films is avoided.

According to a further advantageous embodiment of the present invention the holder can be constructed as a transporting track upon which two supply magazines are moved while simultaneously being turned to the extent of 45° about their longitudinal direction, the movement taking place alternately into a discharging position in front of the introducing slit of the developing automat and into a charging position located to the side of the discharging position. This construction with two supply magazines has the great advantage that the operation of the developing automat does not have to be interrupted when new films must be introduced into the supply magazine. On the contrary, a supply magazine is always available in the receiving location, into which the films to be developed can be inserted. At the same time there is always the possibility of developing films which have just been inserted ahead of the films which have been inserted earlier into the other magazine. This can be achieved by moving the magazine placed in the charging location into the discharging location and moving the magazine placed in the discharging location into the charging location. Furthermore, the coupling of the movement of the two magazines along the guiding track fixed to the developing automat and their rotation about 45° about their longitudinal direction makes certain that the magazines will be always charged in the correct position.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings showing by way of example only, a preferred embodiment of the inventive idea

In the drawings:

FIG. 1 is a perspective view of a developing automat with two store magazines movable along a holder,

FIG. 2 is a sectional view of a store magazine coupled to a developing automat.

FIG. 3 is a diagram illustrating the positions which the individual film sheets can assume in a store magazine.

FIG. 4 is a front view of a store magazine from the side of the removing slit.

FIG. 1 shows a developing automatic 1 having a store magazine 2 for sheet films which is connected airtightly at the side from which the films are introduced. A second similar store magazine 3 is located at one of two

possible charging locations 4 and 5 to the side of the developing automat. A guide track 6 serving as a holder for the magazines is located at the film introducing side of the developing automat. The two store magazines 2 and 3 are movable upon the track from a discharge location 7 into one of the two charging locations 4 and 5. The two magazines are provided on two sides with separate guide pins 8 and 9. Each of these guide pins is in engagement with one of the guide grooves 10 or 11 provided in the track 6. The guide grooves are bent as both ends of the track to the extent of about 45° relatively to the longitudinal axis of the track, so that when the magazines 2 and 3 are shifted along the track they will turn to the extent of 45° relatively to their surface direction shortly before reaching the charging locations 4 and 5. The turning direction is the same for both charging positions. The two magazines are coupled with each other in the moving direction (not illustrated) so that when a magazine is located in the discharging location 7, the other magazine will be located in one of the charging locations 4 or 5.

FIG. 2 shows in a partly sectional view the cooperation of the developing automat 1 with a store magazine 2 light-tightly coupled with its supporting slit 12. In the casing 13 of the magazine upon a front side there is a partly calibrated removing slit 14 the width of which in the calibrated portion is about 1.3 times the thickness of a film. The calibrated removing slit 14 can be closed by a closure 15 which is opened automatically by a stop provided upon the track during coupling to the introducing slot 12 of the developing automat 1. The casing of the magazine has a cover 16 through which film sheets 17 can be introduced. Opposite the cover 16 the casing of the magazine has a base serving as the supporting surface 18 for the film sheets and provided with a recess along which a suction head 19 can be shifted. The suction head is carried by a bar 20 so that it can be moved toward the calibrated removing slit 14 against the action of a spring 21 and also back again. When the supply magazine is coupled to the developing automat the bar of the suction head is in engagement with an actuating frame 22 of the developing automat 1. The bar 20 as well as the frame 22 of the developing automat 1 are tubular in shape. When coupled the bar and the frame provide a direct connection between the suction head 19 and a low pressure producing device (not shown) provided in the developing automat. When the developing automat is coupled, its introducing slit 12 is located directly opposite the calibrated withdrawing slit 14 of the magazine 2. Directly behind the introducing slit of the developing automat there are the transporting rollers 23 and 24 driven by the automat. Directly behind these rollers in the film transporting direction there is a feeler 25 located in the passage of the film sheets 17 which is actuated by the film sheets which have been transported by the rollers.

FIG. 3 is a top view of the supply magazine 2 with the cover removed. In one corner of the base of the magazine there is a recess in which the suction head 19 is located. The head 19 is movable by a bar 20 against the action of a spring 21 in the direction toward the calibrated removing slit 14. The locations of film sheets of different sizes are shown by broken lines in FIG. 3.

FIG. 4 shows a side view of the magazine 2 from the side of the withdrawing slit 14, the closure 15 being shown as raised. It is apparent that only that side of the withdrawing slit which is located opposite the suction

head 19, has a calibrated thickness. The remaining part of the withdrawing slit is wider.

The supply magazine 2 or 3 located in one of the charging positions 4 or 5 can be charged with films of different sizes when the cover 16 is removed. Due to the inclination of the magazine all films slide into its deepest corner. Thus the films of different sizes assume the positions shown by broken lines in FIG. 3. This specific location of the films in the magazine provides that only the lowermost film sheet will be engaged by the suction head 19 and thus only this one sheet will be sucked by the suction head and transmitted through the calibrated part of the withdrawing slit 14. After the closing of the cover the magazine can be shifted along the guide track 6 into the discharging position 7 in front of the receiving slit 12 of the automat. At the same time another supply magazine which was located up to now in a discharging position, is shifted by a chord (not shown) into a charging position located on the opposite side of the guide track. Due to the provision of the two guide pins 8 and 9 engaging the two grooves 10 and 11 of the track, the magazines are turned by 45° relatively to their surface direction during the shifting movement. The location of the guide grooves makes certain that the corner of the supply magazine in which the suction head 19 and the calibrated portion of the slit 14 are located, will be in the deepest position in the charging position. The lock 15 prevents the lowermost film sheet from being pushed out during the shifting movement. When a supply magazine is moved into the discharging position the lock 15 of the discharging slit 14 of the magazine is opened by a cam 26 provided in the guide track 6. Then in the discharge position of the supply magazine the bar 20 of the supply magazine is in engagement with the actuating frame 22 of the developing automat 1. In this position the underpressure of the underpressure transmitter is transmitted by the tubular conduits of the frame 22 and the bar 20 to the suction head 19, so that the lowermost film sheet is firmly held by the suction head. If then the operating frame 22 is shifted toward the developing automat it will take with it the suction head by the bar 20. Then the lowermost film sheet is taken by the suction head and is shifted through the calibrated slit 14. As soon as the film sheet is shifted between the rollers 23, 24 of the developing automat the tubular conduit of the operating frame 22 is aired (in a manner not shown) and the frame is pushed by the automat into the initial position. Then the film sheet is released from the suction head. The transporting rollers then take over the further transportation of the film sheet into the interior of the developing automat. The suction head follows the return stroke of the frame 22 due to the action of the spring 21. The feeler 25 of the automat is shifted by the passing film sheet. As soon as the feeler moves back into its original position it releases the formation of new underpressure and a new stroke of the frame 22. This arrangement provides that the film sheets are always supplied to the developing automat in a correct time sequence corresponding to their treating speed.

Obviously further transportation rollers can be provided in the supply magazines between the calibrated slit and the transportation rollers 23, 24. This has the advantage that the path of movement of the suction head 19 can be made smaller. It is also possible to provide the feeler 25 instead of in the automat 1 in the two supply magazines.

Instead of guiding gooves provided in the guide track it is possible to provide stops at the ends of the track by means of which rotatably supported supply magazines when arriving can be swung in the desired manner about their longitudinal direction. It is also possible to make the discharging location of the supply magazines so wide that it can be reached by mere parallel shifting from the two charging positions. This would require a corresponding adaptation of the developing automat but on the other hand would avoid the swinging of the supply magazines when going over from the charging position to the discharging position.

Finally it is also possible to construct the covers of the supply magazines as slides and to adapt the dimension of the supply magazines to the receiving slides of the cameras so that they can be placed light-tightly upon the upper edge of the supply magazines. If then the base of the receiving slides is also constructed as a slide, then the charging of the supply magazines can take place at daylight merely by pulling the two slides.

I claim:

1. In combination with an automatic film developing machine having an internal film transporting device, a device comprising at least one receiving magazine for exposed film sheets and a holder connecting said magazine to said developing machine, said magazine having a rectangular film sheet supporting surface and a device removing individually film sheets located in a pile upon said film sheet supporting surface, and means driving said removing device and actuated by said film transporting device, said holder comprising means shifting said magazine from a discharging position into a charging position in which said supporting surface is inclined at least by 25° to the horizontal, and wherein said magazine is turned about the normal to the supporting surface, so that one corner of said supporting surface assumes the lowest position of all the four corners to position one corner of all said film sheets in said one corner regardless of the size thereof, said corner being close to said removing device.

2. In combination with an automatic film developing

machine having an internal film transporting device, a device comprising at least one receiving magazine for exposed film sheets and a holder connecting said magazine to said developing machine, said magazine having a rectangular film sheet supporting surface and a device removing individually film sheets located in a pile upon said film sheet supporting surface and means driving said removing device and actuated by said film transporting device, said removing device comprising an at least partially calibrated withdrawing slit in the plane of said film sheet supporting surface, a suction head projecting into the same plane, and means moving said suction head toward said slit and back from said slit, said holder comprising means shifting said magazine from a discharging position into a charging position in which said supporting surface is inclined at least by 25° to the horizontal and wherein said magazine is turned about the normal to the supporting surface, so that one corner of said supporting surface assumes the lowest position of all the four corners to position one corner of all said film sheets in said one corner regardless of the size thereof, said corner being close to said calibrated portion of the withdrawing slit and said suction head being located in said lowest corner of said magazine.

3. A device in accordance with claim 2, wherein said automatic film developing machine has a film introducing slit, said holder having a guide track upon which two of said store magazines are movable while simultaneously turning to the extent of 45° about the normal of their supporting surfaces alternately into a discharging position in front of said introducing slit and into a charging position located to the side of said discharging position.

4. A device in accordance with claim 2, comprising a feeler located in the path of the film sheets close to said film introducing slit, said feeler setting in motion said means for driving said sheets removing device each time a film sheet has passed it.

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