

## SPECIFICATION

### Episcope

5 The present invention relates to an episcope or, in general terms, to an apparatus wherein a non-transparent picture is subjected to top illumination for the purpose of projecting the reflected light to form an image, for direct view, or for reproduction.

#### DEFINITIONS:

10 The term "picture" as herein used designates the visual information physically present on a sheet-like carrier, as, e.g. a photographic print or paper with printing, writing or drawing on it.

15 The term "image" as herein used designates the appearance of a visual information on a screen or a board in result to an optical projection.

20 The term "picture scene" as herein used designates that plane in a projection apparatus ("episcope") onto which, in use, the projection optics is focussed; this plane may physically be defined by the surface of a glass plate or the like but this is not essential.

Further definitions will be given in context with the respective parts of the following specification.

#### BACKGROUND OF THE INVENTION

25 Top illumination projectors or "episcopes" have been known for many years. The picture to be projected is illuminated by a powerful light source and its image is formed on a screen or board or wall by means of a deflecting mirror system and a projection optic system. In conventional  
30 episcopes, the picture is disposed on or beneath the episcope's picture scene and remains accessible to the user. After projection, the picture is manually exchanged for another, and this handling is difficult and complicated.

35 Therefore, attempts have already been made to mechanize the exchange of the pictures. The DE-PS 162 085 describes and illustrates a design wherein the pictures are piled in a compartment and are conveyed by a closed transporter chain  
40 individually from the picture scene into a collecting container. This episcope is intended to be used as a movie projector. In the design disclosed in DE-OS 21 28 117 pictures wound on  
45 a drum are projected, or card-shaped pictures are transported by means of a revolving conveyor belt across the picture scene.

50 In the first-mentioned design it is assumed but not expressly stated that the individual pictures which all have the same dimensions are sufficiently thick and stiff to be engaged by the transporter chain and pushed away from the picture scene, and that with a speed sufficient for movie projection. The pictures must be rearranged  
55 after the projection so that they will lay in the initial sequence in the pile again. The last-mentioned drawback is inherent to the second design mentioned above, too, in case of loose cards being processed, and the cited publication  
60 does not disclose how to solve the problem of removing individual pictures from the pile and to convey them in an accurate position through the

episcope.

65 It is an object of the invention to provide picture exchange means in an episcope or a reflected light viewer wherein the above-mentioned drawbacks are substantially overcome, i.e. wherein a set of pictures to be projected is inserted into the episcope as a pre-sorted entity according to the  
70 sequence of projection, is then projected without interference with the sorting and without readjustment at the episcope, and is finally removed again as such entity, whereafter the next set is processed again in the same manner.  
75 Handling of individual pictures is thus completely avoided.

80 According to the present invention there is provided an episcope or in an incident-light direct picture viewer in which pictures in the form of sheets are stacked one above the other in a picture magazine with a selected picture in the magazine exposed to light from a light source, the selected picture being uppermost in the stack and disposed against a window of the magazine for  
85 projection or viewing, the magazine comprising a first frame member and a second frame member which is relatively reciprocable parallel to the window for cyclic exchange of the uppermost picture within the magazine, and the episcope or  
90 viewer includes a releasable holder by which one of the frame member of the magazine is held in a position in which during projection or direct viewing the window of the magazine is exposed to the light source but the frame members remain  
95 relatively movable to enable picture exchange to be effected.

The exchange magazine operates as follows:

100 In a housing a stack of pictures of uniform size with their image sides facing a viewing window of the housing is urged to the window by a bias arrangement. A drawer is reciprocable within the housing, the drawer removing, by pulling thereon, one picture from the housing (usually the one next to the window of the housing) and returning it to  
105 the stack at the other side thereof; after the picture exchange, the entire stack, and thus the picture to be projected, being flushly pressed against the picture scene.

110 Such picture viewers are disclosed in co-pending British Patent Application Nos. 37449/78 (Serial No. 2005227), 37452/78 (Serial No. 2005637), 37453/78 (Serial No. 2005229), 37454/78 (Serial No. 2005230), 37455/78 (Serial No. 2005231) and 37536/78 (Serial No. 2005638).

115 The pictures collected in a magazine all have the same format but the holder in the episcope may, of course, be designed so that magazines having different sizes can be inserted and actuated. In the most simple case, the reciprocation of the drawer is effected manually even with the magazine inserted into the holder; however, the episcope or a supplemental mechanism may provide motor drive means for  
120 this purpose.

125 An episcope according to the invention is fundamentally distinct from two known designs

which, in this respect, are comparable with the known dispositive exchange projectors, in that the exchange mechanism is not part of the episcopes itself but is provided in the magazines wherein the picture stacks are housed and may be stored. Prima facie this may appear uneconomic. However, such exchanger magazines may be manufactured of modern materials and using modern methods of manufacture in an extremely economic manner while an exchange mechanism integral to the episcopes would have substantially more complex requirements, to provide dust protection, insensitivity to wear and tear and temperature variation, and so on. On the other hand, an exchange mechanism contained in a magazine enables the pictures or other information carriers in the magazine to be examined in the sequence in which they are to be displayed, for example prior to projection in order to check that their orientation is correct or to work through the stack several times when preparing for a conference without the necessity to take care over the proper orientation of the pictures and without the necessity to use for this job a projector or viewer. The picture exchange magazine for the episcopes thus permits, in addition to simplifying the actual display, the filing in good order and the review of the pictures without the episcopes itself. This solution, further, has the advantage that episcopes or episcopes designs which already exist may be adapted to use the magazines with little difficulty.

For sake of completeness it may be mentioned that instead of using a projection screen on which to form the image, the image may be formed on a matt screen plate from its rear side, and in addition a reproducing apparatus may be provided facing the screen plate so that each picture of a stack may be copied automatically. The device could alternatively be constructed as a reflected-light direct viewer in equivalent manner.

Further details and advantageous features of embodiments of the invention will be hereunder explained in a brief summary.

Each magazine contains pictures of the same format. The magazines themselves, however, may have different sizes because they are filled with pictures of different formats. These assumptions are applicable in particular to photoprints, however, the number of different formats being relatively small. Preferably, therefore, the episcopes is designed such that magazines of different sizes may selectively be inserted and the projection may occur without further adjustments. When projecting pictures of different sizes the projected images will have correspondingly different sizes unless additional measures are taken. Therefore, it may be provided that the optics and the projection screen or matt screen plate size are initially adapted to the largest magazine format and that upon insertion of a magazine having a smaller format either manually or automatically by means of scanning of the magazine size the optic is changed in order to project a smaller picture also at the maximum size. In this case the projection

screen or matt screen plate will be designed in square format, the edge length of the square being adapted to the largest edge length of an image to be projected.

On to such a screen or matt screen plate, non-square images may be projected in upright format or transverse format. In a magazine, however, at least sometimes transverse format pictures will be mixed with upright format pictures. Therefore, in a further development of the invention the episcopes will have a device, which may be remotely controlled, by means of which the change from upright format to transverse format or vice versa occurs either by rotating the magazine including its exchange drawer and any motor drive which may be provided therefor, or by rotating the entire projecting portion of the episcopes, or even finally the rotation of the image by each  $90^\circ$  by means of an optical system. The pictures to be projected may be provided with a code or marks, or such coding may be also provided at the outside of the magazine to be scanned within the episcopes, so to cause automatically changes from the upright to transverse format or vice versa.

Since the picture exchange mechanism is housed in the magazine, at least that portion of the magazine by which the picture exchange motion is made (with manual actuation, therefore, the exchange drawer) must be accessible for the user during projection, and such access must be independent of the position of the magazine in an episcopes provided with a rotating device for upright format/transverse format. In more elaborate embodiments, the episcopes will be provided with motor drive for the exchange drawer actuation. If then a rotation of the magazine relative to other portions of the episcopes is provided the motor drive such that it can implement the exchange actuation in at least two positions at  $90^\circ$ , and preferably in all four quadrature positions. These functions, of course, may also be actuated by remote control.

In order to have the picture to be projected always flush in the plane of the picture scene, the picture preferably is urged by a pressure plate housed in the magazine and subjected to spring bias. This pressure device suitably is designed so that the bias is substantially independent of the height of the picture stack in the magazine, and that nevertheless during the picture exchange the pressure is released so to avoid possible exchange damage to the pictures.

The exchange drawer of the magazine during the exchange motion will exert a pull upon the magazine itself which therefore must be held in the episcopes sufficiently rigidly that it will not change its position during the exchange motion, either in the direction to the projection scene or parallel thereto. The engagement means provided therefore may be designed so that they are disengaged by actuation of a key, possibly by remote control, and the magazine may then be ejected by a spring stressed by the insertion of the magazine.

Upon change of the picture size and consequent change of the magazine dimensions preferably the engagement means of the episcope will adapt themselves to the picture size, and that preferably indefinitely. The engagement means may include diaphragms to prevent the area of the picture scene next to the picture from being projected along with the picture.

- 5 The magazine may be provided, for the purpose of immediate viewing of the pictures without projection, with a window covered by a transparent sheet made for example of transparent plastics material. The episcope may in this case be designed such that upon insertion, preferably pushing home, of the magazine said sheet is pushed away or flipped away so that the picture to be projected will about immediately a glass plate having good optical qualities and forming the picture scene of the episcope.
- 10 Scratches on the plastic window of the magazine possibly caused by the handling thereof would then not cause deterioration of the projected image.

- Finally, the pictures comprising image information may be provided in addition with sound information either outside the magazine or preferably in the magazine itself. For the reproduction of such information in this case the episcope would be provided with sound reproducing means, and picture change and sound information change would preferably be actuated by the actuation of the magazine exchange drawer. Again, the reproduction of the sound information may be implemented by remote control.

- The preceding features may be used individually or in combination, in either relatively small, simple and in-expensive reflected light direct viewers or as complex semi- or completely automatic episcope, the episcope having an integral matt screen plate or being designed for projection onto a large projection screen or being switchable between these two functions.

- While it is preferred to actuate the exchange of the magazine by motor drive means, a design in which the picture exchange can occur in any rotational position of the magazine holder will generally result in a large apparatus including a complex mechanism. Therefore, a considerable simplification may be provided if the motor drive means is stationary in the episcope housing and arranged to be coupled to the magazine only in one preferred rotational position of its holder; this preferred position will for reasons to be explained hereunder in general be the transverse format projection position. This design is particularly intended to be used with photographic prints.

- Experience confirms that almost without exception all transverse format pictures have the same orientation - the photographer has no reason to use his camera "upside down". For photographs in upright format experience has revealed that the camera will be pivoted about a quarter revolution normally in one direction by right-handed people and in the other direction by

left-handed people. The right-handed prevail. Moreover high format pictures are rarer than transverse format pictures just because they require an unusual operation of the camera.

- 70 Regarding square format the statements made above with respect to the transverse format will apply.

- Thus, one may assume that in the cassette upon delivery from a photographic-printing firm, most of the pictures (namely those having square format and the transverse format pictures) will lie in a common "correct" orientation and that further most of the upright format pictures (those of the right-handed people) are disposed in a second common "correct" orientation. Accordingly, one may suppose that in the design of the cassette or the magazine in its adaption to the holder most of picture exchange operations may be made without the necessity to rotate the magazine. Therefore, it would not be considered an unpermissible loss of ease of operation if the picture exchange were possible only in one preferred position (transverse format) and that for each other position (the one or the other upright format position) each picture exchange were to require a return to the preferred position. If the user were to be advised that all upright format pictures in the magazine must assume only one of the two possible orientations in order to be correctly projected, only two rotational positions of the magazine would be necessary; a preferred position (transverse format projection) in which the picture exchange is possible and a position for upright format rotated 90° with respect thereto. It may be assumed that only the small number of left-handed people will be forced to reorientate their upright format pictures which will be relatively few in number while all other pictures will be sorted "ready for projection" by the printing firm.

- 105 It will be seen that it is not a drawback but on the contrary it may be even advantageous for the user if the holder after each picture exchange were to return into the above-mentioned preferred position.

- This, however, will bring about the advantageous possibility of designing the elements of the motor drive for this preferred position only, that is, stationary with respect to a possible rotation of the magazine. This reduces the design difficulties; one will work with smaller components which are also more stable.

- Since no portion of the motor drive will turn together with the holder, the housing may be made small, which is agreeable to the user and will reduce the expenses of manufacture.

- 120 It is a prerequisite for easy use, of course, that the magazine may be introduced into the holder in only such a position that it will be correctly orientated with respect to the projection plane and that no upside-down projection will occur. In other words, the magazine on the one hand and the holder on the other hand must fit together in but one only of the eight possible magazine positions.

- 130 By far the greatest majority of all photo prints is

found in three formats : 9 cm x 9 cm, 9 cm x 11.5 cm, 9 cm x 13 cm. Each format requires another exchange stroke of the magazine.

Normally, for each picture format a device

- 5 adapting to the size would have to be provided. Since, however, the cost of manufacture will be relatively reduced with increasing production batches, it is preferred to design the magazine and/or the exchange drive so that they will match
- 10 at least a certain number of formats, or may be made to match by exchange of adaptor pieces without further amendments at the episcopes. This is also advantageous for the stock holding by retailers.

- 15 Further preferred or suitable features of an episcopes of the invention are defined in the subclaims, the significance of the majority of these features being derivable from the following description of embodiments of the invention
- 20 referring to the accompanying drawings, of which

FIGURE 1 shows isometrically an episcopes according to the invention, an exchanger magazine being just in course of insertion;

- 25 FIGURE 2 shows similar to Figure 1 the picture exchange with inserted magazine;

FIGURE 3 is a schematic plan view of such episcopes;

- 30 FIGURE 4 illustrates schematically the adaption of the holder to different magazine sizes;

FIGURES 5 & 6 illustrate schematically the holder shown in Figure 4 with magazines of different size inserted thereinto;

- 35 FIGURE 7 is a schematic partial longitudinal section view through an alternative embodiment of the holder;

FIGURE 8 is a schematic longitudinal section view through an embodiment of the episcopes;

- 40 FIGURE 9 illustrates a detail of Figure 8 in a modified design;

FIGURE 10 is a schematic plan view to the episcopes of Figure 8;

- 45 FIGURES 11 to 15 show in substantially schematic form further embodiments of episcopes according to the invention;

FIGURES 16 to 18 illustrate the design of a reflected light viewer by which pictures contained in an exchange magazine may be regarded in enlarged scale;

- 50 FIGURES 19 to 21 shown in partial sections the functional elements of an episcopes with respect to the magazine holder, the exchange actuation, and the rotation of the holder;

FIGURE 20a illustrates an alternative to Figure 21;

- 55 FIGURE 22 shows isometrically an episcopes with an exchange mechanism stationary with respect to the rotatable holder;

FIGURE 22a is a schematic sketch relating to the design of Figure 22;

- 60 FIGURE 23 is a section view of the magazine holder;

FIGURE 24 shows an individual magazine in side elevation;

- 65 FIGURE 25 shows isometrically the holder with an inserted magazine;

FIGURE 26 shows schematically the possible coupling between magazine and exchange drive;

FIGURE 27 shows two alternatives for one of the coupling possibilities;

- 70 FIGURE 28 shows schematically two possibilities of automatic stroke adaptation;

FIGURE 29 shows on an enlarged scale a side elevation of a portion of the stroke adaptation;

- 75 FIGURES 30 to 32 illustrate schematically further possibilities of stroke adaptation;

FIGURE 33 shows magazines having different formats for the exchange drives of Figure 28;

- 80 FIGURE 34 shows magazines having different formats for an exchange drive having a constant stroke;

FIGURE 35 shows a device for the adaptation to different formats;

FIGURE 36 is a section along the line 36—36 of Figure 35;

- 85 FIGURE 37 is a section along the line 37—37 of Figure 35;

FIGURE 38 shows a plan view and

FIGURE 39 an axial section view through an exchange and rotational drive;

- 90 FIGURE 40 shows in plan view and FIGURE 41 in axial section view a second embodiment of an exchange and rotation drive;

FIGURE 42 is an enlarged illustration of the coupling mechanism between drive and magazine

- 95 for the embodiment for Figures 40 and 41;

FIGURE 43 shows in plan view and

FIGURE 44 in side elevation a third embodiment of the exchange and rotation drive;

- 100 FIGURE 45 shows isometrically an embodiment which can be designed to be very small, in particular for square pictures only;

FIGURE 46 shows isometrically and schematically an embodiment having a holder supported at the circumference of a rotating dish;

- 105 FIGURE 47 shows schematically the device for the apparatus of Figure 46 in plan view;

FIGURE 48 is an elevation view seen in direction of arrow 48 in Figure 47;

- 110 FIGURE 49 explains an embodiment having flap mechanism for the insertion of the magazine;

FIGURE 50 is a schematic longitudinal section view of Figure 49;

- 115 FIGURE 51 shows in plan view a mask device which simultaneously causes a stroke variation for the exchange operation;

FIGURE 52 is a section view along line 52 of Figure 51;

FIGURE 53 shows an alternative coupling system for the motor driven exchange;

- 120 FIGURE 54 is a section view along the line 54—54 in Figure 53;

FIGURE 55 shows in front elevation and

- 125 FIGURE 56 shows in side elevation, partly in section, a diaphragm device in the beam path of the episcopes moving simultaneously with the holder;

FIGURE 57 is an isometric view of an exchange drive similar to that of Figures 40 to 42;

- 130 FIGURE 58 is a vertical section view along line 58—58 of Figure 57 including the episcopes

housing portions adjacent to the drive means;

FIGURE 59 is an isometric view of a magazine to illustrate means preventing misoriented insertion thereof into a holder;

5 FIGURE 60 shows in section the latch means in the holder;

FIGURES 61 & 62 show in the same way as Figures 59 and 60 an alternative solution to the same problem;

10 FIGURE 63 is an enlarged section view of the stop pin of Figures 62;

FIGURES 64 & 65 show in the same way as Figures 59 and 60 a further alternative solution to the same problem;

15 FIGURE 66 is similar to Figure 65 but illustrates the situation with a properly oriented magazine inserted;

FIGURE 67 shows in substantially schematic form the system of Figures 64 to 66 arranged to display to the user misorientation of the magazine;

20 FIGURE 68 is an isometric illustration of a copy printer which operates in accordance with the principles of the present invention;

FIGURE 69 is a plan view of the printer of Figure 68;

FIGURE 70 is a schematic vertical section view of the printer of Figure 68;

FIGURES 71 & 72 are illustrations respectively similar to Figures 69 and 70 showing a second embodiment of a copy printer; and

FIGURES 73 & 74 are illustrations respectively similar to Figures 68 and 70 but relating to a third copy printer embodiment.

In Figure 1, in the usual manner projection optics 1 including focus adjustment means 15 are provided in an episcopes housing 3. A magazine holder 2 is rotatable relative to the housing 3 by up to 360° as indicated in Figure 3 and comprises an insert compartment 16 for picture magazines

40 17. The magazine is inserted in direction of arrow 18 in Figure 1 and is held in locked manner with its housing 4 in the episcopes or, precisely, in the magazine holder 2 thereof. It will be seen in Figure 2 that with the magazine inserted the slider 7

45 may, by gripping handle 6 thereof, be pulled out of the magazine housing 4 which has been locked in the holder, and may be pushed home again in order to effect the picture exchange. For this purpose it is advantageous that the loading

50 opening of the slider for the stack 8 opens upwards and that upon each exchange the last-projected picture is freely accessible on the top so that it may be removed, if desired, or exchanged against another one. For the rotation of the holder

55 2, the projector housing 3 may be held at handles 5 where it may also be held during the slider reciprocation unless the episcopes is sufficiently heavy to rest on a table or the like. During the rotation of the holder, of course, the magazine is taken with it so that pictures inserted upside down

60 may, nevertheless, be correctly projected after 180° of the holder. In a similar manner the change between upright and transverse format picture is possible.

65 It will be understood that instead of manual

actuation of the slider, or in addition thereto, a drive system with, preferably, an electric motor may be provided in the episcopes and this drive system may be remotely controlled. Such drive systems may be designed to be rotatable together with the holder relative to the housing 3. The latter rotating movement, in turn, may also be motor-driven and, if desired, remotely controlled. It was indicated above that a magazine once inserted will remain in its position relative to the projection optics so that the images will appear always at the same position on the projection screen. Moreover, the exchange magazine itself will preferably be provided with a transparent window plate in its housing, said window plate facing the projection optic (the deflecting mirror in an episcopes) and forming the picture support thereof. Due to the spring bias in the magazine, the pictures, thus, lie flush against this transparent window plate so that once the focus of the optics has been properly adjusted, the episcopes will remain focussed for all the pictures of the magazine and upon magazine exchange in most cases slight tolerances only have to be accommodated. If the sight window of the magazine is used as the picture support, the episcopes may be open in the plane of the picture scene.

Further it would be possible to provide in the holder compartments for a plurality of magazines whose pictures will be projected in sequence and possibly under the control of a program. Alternatively, a multi-magazine exchange mechanism may be assembled to the one compartment of the episcopes. Similarly, a picture identification system and a picture quick access mechanism may be provided within the invention.

Details of the magazine holder will be explained hereunder with reference to Figures 4 to 7.

In order to handle most different picture sizes the holder should be designed such that it will automatically adapt to the respective magazine dimensions. E.g. photographic prints mostly have the format 9 cm x 9 cm, or 9 cm x 11.5 cm, or 9 cm x 13 cm, and it is expected that magazines for these sizes will be marketed. However, even for photographic prints, different formats exist and it cannot be predicted whether or not still other sizes will become customary.

Therefore, the holder shown in Figures 4 to 7 is designed so that it will infinitely adapt itself to the magazines sizes within a given range. The holder comprises in one example two lateral diaphragms 9, 10 which may be spread apart against bias springs in direction of the arrows 20 upon insertion of a magazine housing 4 in direction of arrow 21 into channels (not shown) at the underside of the diaphragms. A transverse diaphragm 11 may be pushed back against the bias of springs 22 once the magazine has been introduced into the channel facing the transverse diaphragm 11. The positions of two magazines of different size and the allotted positions of diaphragms 9, 10 and 11 are indicated in Figures 5 and 6, respectively. Figure 6

further illustrates schematically a locking lever 14 engaging a lock indentation 23 in the magazine housing 4; the lock indentation 23 would be provided at magazines of different formats always at the same point, i.e. spaced the same distance from the front wall 24 of compartment 16. Upon release of locking lever 14 the magazine is ejected by action of the springs 22 or by an auxiliary spring. Suitably, the holder and the magazines are designed such that all magazines of different size would be positioned in the centre of the picture scene, the position of indentation 23 being selected accordingly.

Figure 7 illustrates schematically how a cover portion 12 of the diaphragm 9 or 10 may engage over the frame 13 which surrounds the viewing window 25 of the magazines so that during projection only the area of the window itself with the picture therebeneath would be seen on the screen and no image of the magazine frame would be formed.

In Figures 4, 5 and 6 there is shown a strip 28, made preferably of felt, disposed on the transverse diaphragm 11 adjacent the end edge thereof facing the magazine. This felt strip abuts a glass plate provided in the episcopes above the magazine holder and serves to wipe dust from this plate during magazine exchange. In fact it is preferred to cool this plate and the light source which is necessary because of the high output of the light source. As shown in Figure 8 the cooling is effected by drawing air from the face of the plate opposite the light source.

The episcopes of Figure 8 comprises two main portions: the projector housing 30 supported on feet 32 and the holder assembly 36 disposed therebeneath, rotatable about a pin 34. The pin 34 is mounted on a support plate 38 which, in turn, is rigidly connected to the feet 32. The projector housing 30 is substantially square (cf. Figure 10) while the holder assembly fits into the spacing between two diagonally opposite feet and is therefore rotatable about 360°.

Beyond the projection mirror 40 there is a radial blower 42 provided with a blower channel 44. They both serve the purpose to draw cooling air about the light source 46 and also from the hollow space 48 between a glass plate 50 at the bottom of the projector housing and an inserted magazine 17. The air passes through a gap 52, the hollow space 48 being bounded by felt strips 54 (or alternatively as shown in Figure 9, by means of labyrinth seal 54' disposed in the same positions). These sealing means at the same time prevent ingress of ambient light.

The service life-time of the light source depends substantially upon the number of switching-on and off actions. Therefore switching off the light source with each picture exchange should be avoided. In conventional episcopes for individual pictures each such change would result in considerable dazzling. With the episcopes according to the invention this problem is less severe because during picture exchange the next picture is already visible. The display of the images

of this exchange event, the image possibly being out of focus, is disturbing. Therefore, it is preferred to introduce a shielding diaphragm together with movement of the magazine exchange drawer (or to make it move with the drawer or its drive means at a greater speed), said shield diaphragm suppressing the projection during picture exchange. Such a shield diaphragm may also prevent rotation of the magazine (transfer from transverse to upright format) from being displayed on the projection screen. Finally, the opening of such a shield diaphragm may be suppressed during an arbitrary number of picture exchanges by suitable control means.

Figure 11 illustrates the optical design of an episcopes using projection onto an integral projection screen. The picture disposed in the viewing window of a magazine 300 is illuminated by a lamp 301, the illumination being improved by a reflector 302 and a mirror 303. An objective 304 projects an enlarged image onto a screen 305. The apparatus is contained in a housing 306.

Figure 12 illustrates the optical principle of an episcopes using selective projection onto an integral screen or, outside the episcopes, onto an external screen. The illumination of the picture in the magazine 300 is the same as in Figure 11. An objective 307 may assume two different positions, one fixed position for the projection onto the integral screen and an adjustable one for the projection onto the external screen. A mirror 308 must also be changed in position depending upon the desired manner of projection.

Figure 13 shows the same optical principle as Figure 12. There is a change, however, of the position of the picture negative 300 with respect to the screen. The illumination of the picture in the magazine 300 is the same as in Figure 11, and similarly displacement of objective 309 and rotation of mirror 310 are implemented in the same manner as in Figure 12.

Mirror 310 is designed as a plane mirror on one face (for long range projection) and as concave mirror at its other face. The concave mirror is used for projection onto the integral screen and reduces the focus length of the optical system.

Figures 14 and 15 show a further optical principle for selective projection of the uppermost picture in the magazine onto an integral or an external screen, again the illumination of the picture being made in the same way as in Figure 11.

Depending upon the desired manner of projection an optical system 311 is displaced longitudinally. In one extreme position (Figure 14) the objective projects the image onto the integral screen. In the other extreme position the beam path extends via mirror 313 and objective 314 to an external projection screen. The objective 314 is adjustable in its spacing with respect to the mirror according to the distance from the episcopes to the external projection screen. Figures 16 to 18 illustrate the design of a viewing apparatus which permits enlarged direct viewing of the uppermost picture in a photoprint magazine. Viewer housing 315 is designed with a slot shaped opening for

inserting a magazine 316, the magazine housing being sufficiently firmly held by a snap mechanism 317 so that it remains fixed during draw pulling to exchange the displayed picture. The viewer

5 comprises further one or several lamps 318 which with the aid of a reflector 319 illuminate the uppermost picture in the magazine, as well as a lens 320 which permits an enlarged viewing of the picture. For disposition on, say, a table a support

10 321 is provided which may be foldable. The illumination is switched on by means of button 322.

Figures 12 to 21 show in detail a magazine holder on the wall of an episcopes including means to actuate the exchange movement and a rotating movement.

The magazine 339 is held in place in the episcopes housing 338 on two pins 340 which fit into respective openings 341 in the magazine.

20 These receiving pins 340 have resilient projections at their ends so that the magazine will remain securely fixed.

The pins 340 are disposed on radially movable sliders 342 which may be displaced along slots 343. The pins 340 are guided in a guide track 344 opposite the magazine.

A motor 345 is coupled via a driving wheel 346 to a track disc 347 to rotate it and as long as a slot disc 348 disposed parallel thereto remains stationary, the sliders 342 and, thus, the receiving pins 340 will travel radially outwards and open the magazine 339, i.e. they initiate the outwards movement of the exchange drawer.

As soon as pin extensions 348' will reach the half axes of the elliptic track 344 the sliders 342, and with them the receiving pins 340, move radially inwards again and the magazines 339 is closed again, i.e. a picture exchange has been implemented.

The slot disc 348 is locked and unlocked by means of a detent 349 which is pivotably journaled and may be actuated by, for example, a solenoid or a pulling line 350.

If the magazine 339 is to be rotated - because a picture was inserted upside down or because of the different viewing position of upright format and transverse format pictures - the slotted disc 348 is unlocked from the detent 349 so that it may rotate together with track disc 347 driven by motor 345. Therefore, no exchange motion of the magazine will occur.

Because the two rotatable discs 347 and 348 must have a central opening 351 in order to make the uppermost picture in viewing window 352 of the magazine visible to the episcopes optics, the discs are supported at their outer edge 353; three pairs of rollers 354 serve this function.

The sliders 342 are designed so that cassettes having smaller sizes, too, may be clamped by means of the receiving pins 340. For this purpose the slider may be pivoted about 180° so that a second pin 355 will be disposed closer to the disc centre because of the eccentric mounting and the spacing pin to pin will be reduced. Since the stroke (half axis of ellipse groove 344) is

dimensioned for the magazine of greater dimension exceeding that of the smaller magazine, the second pin 355 is mounted such that a lost motion stroke will result due to the rod 356. The stroke motion will become active only when the slider abuts the rod end 357.

The slider surface 358 engaging the smaller magazine prevents the pivoting away of pin 355 upon the return push in a radial direction.

Figures 19 to 21 show the disc 347 in the course of rotation and disc 348 fixed in position. The magazine, therefore, is partly opened. Figure 20a shows the pin support in the inverted position, i.e. for receiving of a smaller magazine.

Figure 22 is a general view of an episcopes provided with the features of the invention. Conventional projection optics 130 are mounted in a narrow front wall of episcopes housing 131 which also carries a user-operated key board 132; the key board may be pulled off to provide remote control as has been proposed for TV sets. The key board comprises a conventional on-off switch, a W-key which may be depressed to command picture exchange, and a H-key which upon depression causes transition from transverse format projection to upright format projection. Adjacent the top surface of the housing there is at one side an insert compartment 133 for a magazine. When not in use, the compartment may be protected from dust by a lid. Figure 22a shows schematically a projection mirror 129 and the position of the magazine 128 during insertion and exchange.

Preferably the magazine is disposed in the housing so that its window extends parallel to the optical axis of the projection optics because this design requires only one mirror. It is, however, not essential to provide lateral insertion of the magazine. The insert compartment may be provided in a flap pivotably connected to the housing, or there may be just a lid which, once opened, permits access to the magazine holder.

It will be understood that the episcopes housing of Figure 22 must have certain minimum sizes for its length and width. The length must at least slightly exceed the length of the magazine in direction of its exchange motion plus the stroke necessary therefor and the width must be at least equal to the diagonal dimension of the magazine to permit its rotation. If it is intended for the design to be even more compact, it is possible during the exchange operation and/or the rotation for parts to pivot outside the housing. For obvious reason the closed design is preferred. If the apparatus is intended to be usable for magazines having different format, the above considerations, of course, apply to the maximum formats. However, it is to be noted that although the holder must have a predetermined width (for example for pictures having a width of 9 cm) that, however, the magazines may have different lengths (for example for pictures having 9 cm, 11.5 cm and 13 cm respectively), because the picture alignment is independent of the magazine length.

In the embodiment the holder is rotatable about

a pin 134 aligned with respect to the magazine viewing window centre. The coupling of the rotation drive via a pin disposed at the rear with respect to the magazine although resulting in a simple design, will increase, however, the space requirements. Therefore, it may be preferred to provide the holder with a circular flange and to make the rotational drive act at the circumference. In this case, the holder 139 could have an H-shaped contour and a profile into which the magazine may be inserted in one ("correct") orientation only. This is assured because the magazine has a guide groove 136 asymmetrically disposed with respect to the magazine thickness, said groove having an insert-stop 136'; to define the insertion depth an indentation 136 is provided at the bottom of the guide groove, a locking detent 137 engaging therewith and being liftable by for example a control magnet (not shown). Side webs 138 in the holder 139 engage a groove 135 (cf. Figures 23—25).

There are different ways of executing the exchange movement of the magazine frame members: one may retain one frame member stationary in the holder and move the other one only; one may retain the holder stationary and make the frame members move relative thereto by one half of the stroke; and one may let a part of the holder go along with each moved frame member. It is preferred to leave the holder stationary and to move the frame members symmetrically with respect thereto, because then in the projection position the magazine will assume with respect to the episcopes housing a position favourable for illumination. This embodiment is shown herein; both frame members have each an engagement hole 140 for coupling with the motor drive.

At first with reference to Figure 26 different possibilities for coupling a motor drive to the magazine are to be discussed. In Figure 26 the first frame member or housing is designated 141 and the second frame member or drawer is designated 142. Although it is not essential it is preferable to guide the drawer in the housing and to fit it into the contour of the latter. At least that part of the drawer where the motor drive acts upon must remain accessible.

In principle, couplings to the window side (a) and the rear side (b) surface of the drawer, its front wall (c) and its narrow edges (d) are provided. Similar couplings are also provided for the housing. If a press fit attachment is chosen the two opposite sides must be accessible and the drawer must be sufficiently rigid and strong. If a positive attachment is chosen, it is preferable that it does not engage the window surface of the housing because this would increase the space requirement. Therefore, a front wall or rear side positive attachment is preferred. Two examples for the front wall attachment are indicated schematically at (c) in Figure 27. At the left side of the Figure a double hook 143 is provided which engages a rectangular opening 144 which is sufficiently large to permit disengagement by

elastic bending of the hook 143 (e.g. by means of a magnet); at the right side of the Figure the attachment comprises a double anchor 145 which engages an aperture 146, said anchor being disengageable by compression.

An attachment using a pin, however, is preferred, the pin fitting into the engagement hole 140 giving simple and space-saving designs which moreover, permit automatic adaptation to different strokes when required.

This example is schematically illustrated in Figure 28. A link 147 has a pin 148 which fits into a hole and is elastically movable with respect to a lever 149 which moves through a stroke adequate for the maximum magazine format. A spring 150 absorbs the over-stroke when it occurs. The link 147 and the lever 149 may be slidably movable relative to each other as shown in the right-hand side of the Figure or pivotable as shown at the left-hand side of the Figure. The elastic coupling has the further advantage that it is able to absorb variations due to manufacturing tolerances. If it is intended, however, to change stroke with the format, the design shown in Figure 29 may be chosen: a switch actuating protuberance 152 is disposed on the link 147 and the lever 149 carries a switch 151 for reversing the stroke direction. The spring 150 is dimensioned such that it is stiff relative to the counter-acting force due to friction between drawer and housing which occurs during a picture exchange, but it is resilient with respect to the holding force retaining the holder and therefore becomes effective when the drawer reaches its outer end position.

Figures 30 and 31 show schematically a magnetic coupling. A link 153 moves through the maximum stroke and a magnet 154 mounted on the link acts upon a soft iron member 155 on the front wall (Figure 31) or the rear side (Figure 30) of the drawer. The magnetic force is sufficiently great to overcome the friction between drawer and housing, however, insufficient to pull the entire magazine off the holder or to damage the magazine. The operation is similar to that of Figure 28.

As shown in Figure 32 the stroke inverter switch 151 may alternatively be stationary and actuated by an actuating member 156 on the housing which upon reaching the full drawer stroke operates the switch.

Figure 33 shows three magazines of different formats having engagement holes which are spaced by the same distance from each other and are disposed symmetrically with respect to the centre of the picture. These three different magazines may be used with the coupling system of Figure 28, for example. It is to be noted that the coupling occurs in the centre of drawer and housing across the magazine width so that during a picture exchange motion no tilting torques which would cause jamming or excessive friction in the motion will act upon housing and drawer.

One may, however, alternatively operate with a given fixed stroke suited to the largest magazine if the tolerance problem is of no importance,

provided that the engagement points of the magazine itself are designed so that stroke adaptation can take place. An example is shown in Figure 34: only the longest magazine 113a has engagement holes 60 while the two other smaller formats 113b, 113c have engagement slots 162 and 164, respectively, having a length corresponding to the half the difference between the stroke of the magazine 113b or 113c and the stroke *h* of magazine 113a. The lost motion of the stroke will be taken up at the beginning of the drawer drive movement.

Alternatively, one may provide the coupling positions on magazines of different sizes at different points, so that the exchange drive will engage suitably geared-down links. A manual adaptation is also possible. Further, it is not essential that a motor drive be provided for the pull as well as for the push motion, the energy for one of the motion directions may be implemented by the tension or compression of a spring during the motion in the other direction by the motor.

The actual coupling or engagement may be controlled in different manners; the coupling may occur automatically upon insertion of the magazines, one may provide it by actuation of an "Exchange" key and immediately disengage thereafter, or one may insert the magazine in one projection position (preferably in the upright format position) and initiate the coupling with the exchange drive by rotating the holder; if then during the operation a variation of the format occurs, an automatic disengagement and re-engagement will take place.

So far it has been assumed that all magazines have the same width and therefore fit into the holder. It is, however, also possible to provide adaptation to smaller widths by means of an insert adapter. Examples of such adapters are illustrated in Figures 35 to 37. In Figure 35 the holder 139 is shown which, in this case, however, has webs 166 of reduced length. A control rod 167 for a switch to interrupt the circuit for the illumination in case of no magazine is inserted extends through the centre of its journal bearing hub 134.

An adapter 138 fits into the holder, the end position of the adapter being defined by the stop 169. In the thickened lateral brackets 170 helical springs 171 are housed which may be compressed under the pressure of the webs 166. Their bias serves to eject the adapter upon release of a locking system. The latter comprises a resilient tongue 172 integrally formed in the plastics material of the adapter, said tongue engaging behind an edge 173 of the holder which serves as locking member.

The rear side of the adapter is open so that the magazine may be coupled to the elements 174 and 167. The webs 138' serve to position the magazine in the adapter. The aligning indentations 136 cannot become effective, however, in this case because they would be covered by the brackets 170. Therefore, the holder has in this case an alignment pin 174 engaging an alignment indentation (not shown) at the rear side of the

magazine, said alignment pin being disengageable against spring bias for the purpose of removal of the magazine or, alternatively, able to be used for ejecting the magazine. For this purpose the adapter is open at at least one of its sides.

When the adapter is disposed in the holder it will turn together therewith. However, the surroundings of the projected picture may be shielded in another manner, too, if a magazine is used having dimensions smaller than the maximum format. Such shields could be disposed somewhere in the beam path of the projector, however, the solution by means of the adapter is the preferred one.

The adapter also can be used to achieve a stroke adaptation. All adapters will then have — as far as the drive is concerned — the same design and require the same stroke, however, depending upon the magazine fitting to the adapter, the stroke will be geared down correspondingly by means of, say, a linkage system. It may be preferred to supply each episcopes with a set of the most common adapters.

In the three embodiments described hereunder for the exchange drive the insertion of the magazine takes place in the "upright format position", however, the exchange will be made in the "transverse format position". The means for ejecting the magazine are not illustrated. They may be accommodated stationary in the housing, namely, opposite to the insertion compartment where, as may be seen from the following Figures, the necessary space is available.

There is shown in Figure 38 the housing 1100 of the episcopes. From housing 1100 a hollow cylindrical hub extends, a shaft 1102 freely rotatable being journaled in the interior thereof. The shaft carries a magazine holder 1103 and is rigidly fastened thereto. On the outer wall of the hub or the hollow shaft 1101 a pulley 1104 is journaled and freely rotatable. The pulley is rotated in one and the same direction via a belt 1105 by means of a motor, the motor being preferably a slit pole motor; which motor preferably also drives a cooling fan. The pulley 1104 is slidably movable in the axial direction along the hollow hub 1101 and is biased into the position shown in Figure 39 by means of a helical spring 1106. Upon pressure being exerted onto an exchange means 1107, e.g. by means of a magnetic switch acting at a position indicated by arrow 1108, the pulley 1104 will be shifted towards a gear wheel 1109.

The pulley 1104 and the gear 1109 carry claws 1110 and 1111, respectively, which are interengaged by the displacement due to the exchange means 1107 so that the gear will be taken along. The gear 1109 also is freely rotatably journaled on the hollow hub 1101. Its teeth engage toothed racks 1112, 1112'; each toothed rack is slidably guided in a rail 1113 rigidly connected to the episcopes housing 1100. Each toothed rack carries an extension 1114 extending at an angle to the symmetry axis. Each extension 1114 carries a knob or coupling pin 1115 which,

magnetically actuated in common with the exchange means 1107, may be brought to engage an engagement hole of a frame member of the magazine. The movement of the toothed rack with the extension 1114 is enabled because a sheet metal piece 1117 connecting the two rails 1113 with each other has slots 1118. An end switch 1119 is disposed as shown to disable the solenoid circuit from the exchange means 1107, but it does not affect that for the coupling pins 1115 so that the pulley 1104 is disengaged and the gear 1109 may revolve in the counterdirection; this return revolution occurs under the action of springs (not shown) biased by the outwards movement. Two links 1121 are pivotably connected to extension 1114 at 1122 and may again be coupled with holder 1103 by means of magnetically actuated pin couplings 1123. These links serve to rotate the holder. Upon depressing a means "H" as indicated at 1120, which is simultaneously and electrically locked, an actuation of the claw coupling between pulley 1104 and gear 1109 will take place; the magnetic couplings 1115 and 1123 mutually disable each other so that only one of them at a time may become activated. Upon actuation of 1120, thus, the motor drive is used to rotate the holder, the exchange drive being uncoupled. The resetting occurs as before by means of spring bias; one may provide an end switch to interrupt the circuits of 1108, 1123, 1120. Similarly, an end switch 1119 is provided to switch off the circuits of 1108, 1115.

One link 1121 will be sufficient if a rotation is to be made in one direction only. An embodiment is shown wherein a rotation through 90° occur in two directions. Figures 40, 41 and 42 show a further embodiment. A pulley 1201 has the same design and function as the pulley 1104 in the preceding embodiment, however, it is axially displaceable in both directions. Upon displacement in direction of arrow 1202 coupling with the rotation shaft 1203 takes place, the latter being fastened to a holder 1215 for magazine 1204. Upon displacement in direction of arrow 1205 a coupling with gear wheel 1206 takes place which engages two gear crowns 1207, 1208. The gear crowns each carry an eccentrically disposed and resiliently yielding pin 1209 each of which is pivotably coupled to pin 1212 via a link 1210 with slider 1211; the sliders 1211 are slidably guided along two rods 1213. Each slider 1211 carries a magazine drive cam 1214. Upon rotation of holder 1215 and, thus, of magazine 1204 the cam is pushed out of engagement against the bias of a bias spring 1216 until a slot shaped indentation 1217 gets over the cam so that the cam 1214 may engage slot 1217. Upon reciprocation of the sliders the magazine will then be opened and closed under drive by the motor. The bias spring 1220 for the crank pin 1209 is sufficiently long to not only absorb tolerances but also to absorb different strokes for different formats. The return of holder 1215 may take place either under spring force, the spring being biased by the motor driven forward rotation, or by means

of a changer gear system which reverses the rotation direction, or in similar manner. The ejection of the magazine 1204 from holder 1215 occurs by depressing an ejector key 1222 (Actuation key 1222' in Figure 22).

The next embodiment is illustrated in figures 43 and 44. The difference from the preceding embodiments consists in that only one drive cam 1306 provided having two eccentrically disposed crank pins 1309 from which cranked rods 1301 act upon the slider 1311. Since the crank rods cannot pass the bearing of the cam which carries the eccentric pins, only a half revolution is provided and the return of the exchange drive occurs under the action of a tension spring 1302 biased during the extension. In Figure 44 there is shown a different design of the switch fork 1303 for switching between exchange drive and rotational drive.

Figure 45 shows schematically how a very compact apparatus could be designed. The block 1320 which indicates the outside of the episcopes has added to it for the operation only an attached guide member 1321 which when the episcopes are out of service may be fitted within the contours of the episcopes. The guide member shields an extending frame member 1322 of the magazine during the exchange operation and also serves to guide it.

Figures 46 to 48 show a further embodiment of an episcopes. The holder is connected to a rotatable mounting 1330 or forms a part thereof. The rotatable mounting is supported by four bearing and guiding rollers 1331 at its circumference so that the frame members of the magazine remain accessible for the exchange operation and find space to pass between any two rollers 1331. For the rotation of the holder a motor drive is provided at the circumference of the rotatable mounting and rotates it by means of a friction gear 1332 in one direction by means of a friction gear 1333 in the other direction. Both friction gears engage with each other via cogs and one of the gears (1332) is driven via a belt drive 1334 from a motor (not shown). Since both friction gears are journaled on a toggle 1335 which is pivotally supported at 1336, by exerting pressure upon the lever extension 1337 in one or other direction, one or other friction gear may be brought in engagement with the rotatable mounting. The inverting control may use end switches (not shown) as described above.

Figure 49 shows isometrically and Figure 50 shows in cross-section how with such a design the insertion of the magazine may be effected. A flap 1340 is pivotably connected at 1341 to the rotatable mounting 1330, the flap opening outwards, however, permitting after closing thereof the exchange movement of the inserted magazine. The rotatable mounting may be supported either by means of the above-mentioned rollers or alternatively or supplementarily by means of a front bearing.

Figures 51 and 52 show schematically how by means of an adapter — cf. Figure 35 —

adjustment of the stroke for the exchange movement may be provided.

At the rear side of adapter 1400 two pivotable levers 1401, 1402 are journaled at 1403 and 1404, respectively. Each lever has a slot hole 1405, into which a pin 1406 extends. Each pin is mounted on a slider 1407 slidably displaceable relative to the adapter in a guide track 1408. A spring 1409 biases both sliders towards each other into a start position.

Couplings for the motor drive may be provided on the levers at several points, for example at 1410 and 1411, and depending upon the spacing of the coupling from the pivot points 1403 and 1404 a different pivot angle motion of the levers will result upon the same stroke of the motor drive.

This pivoting is transmitted to the frame members of the magazine by means of resilient tongues 1412 carrying engagement pins 1413 and mounted on the sliders 1407.

Figures 53 and 54 show a stroke adapter mounted in a magazine holder. At the narrow slides 1500 of the magazine, extensions 1501 engage respective inwardly biased leaf springs 1502. Facing leaf springs are connected together by means of a transverse bracket 1503. The frame members of the magazine 1504 are provided with stop shoulders 1505 onto which the extensions 1501 abut upon the outward movement of the brackets and the springs. Up to the stop shoulders 1505, however, there is lost motion. The stroke path required for each magazine is, thus, built into the magazine itself and will be scanned. The rest position of the springs is fixed by means of locking protuberances 1506 engaging respective indentations 1507 in the holder.

Figures 55 and 56 show a mirror 1600 within episcopes housing 1601. The mirror is mounted on a support 1602 in a manner not illustrated in detail. On the side of the support opposite to the mirror there is a bearing hub 1603 on which a sleeve 1604 is journaled. A number of radial spokes extends from the sleeve; preferably there are three spokes 1605 extending outwards and the spokes carry a toothed gear wheel 1606 on a ring 1607. On guide means 1608 and 1609 are provided for two pairs of diaphragms 1610, 1611 displaceable in a radial direction with respect to the hub journal, and are suitably displaced when a change of format is required. Upon a change from upright format to transverse format, however, the diaphragms will rotate without variation of their radial position about each 90° together with ring 1607. The drive for the ring rotation is provided by means of pinion 1612 whose shaft 1613 is driven by the same motor and about the same angle as that of the magazine holder.

The spokes are disposed so that the holder 1602 will not interfere with the rotation because an angle of at least 180° will remain unobstructed.

Figures 57 and 58 illustrate in detail an exchange drive of the type shown schematically in

Figures 40 to 42.

In Figure 58 there is shown a portion of an episcopes housing 1700 which carries the exchange drive, the housing having a magazine insert opening 1702. On the bottom of the housing a frame 1704 is mounted in a conventional manner, the frame having an approximately U-shaped section and being made of sheet metal stiffened by corrugations 1706. Frame limb 1708 innermost with respect to the housing carries a bearing 1710 wherein an axially fixed shaft 1712 of a magazine holder 1714 is journaled. Coaxially aligned with this bearing, a shaft 1716 with two cranks journaled in another frame limb 1718 and driven by means of a toothed gear system 1720 which, preferably, provides a gearing-down; the gear system is driven by a pinion 1722 at the end of a drive shaft (not shown) with axis 1724. In the space between the frame limbs 1708 and 1718, there is housed a gearing system for rotation of the magazine holder 1714 driven by the same drive shaft and may be coupled to the magazine holder shaft 1712 thereby uncoupling drive gear system 1720; in order to keep the illustration comprehensible, however, the means are not shown here and reference should be made to Figures 40 to 42.

Drive sliders 1728, 1730 are slidably mounted in slot guides 1726 in the limb 1708. For ease of assembly, the slot guides are provided at 1732 at their ends with enlarged apertures through which the respective sliders may pass. The coupling of the sliders with the magazine frame members 1734, 1736 and their uncoupling will occur automatically upon rotation of the magazine holder 1714 through 90° from the position shown in Figure 57 (insertion position, and also upright-format position) into the exchange position. For this purpose the coupling means of Figure 42 are provided which, however, cannot be seen in Figure 58. The cranks 1738 of shaft 1716 are coupled to the drive sliders 1728 and 1730 by means of links 1740 and 1742, respectively. These links are indicated in the drawing by dash-dotted lines. An elongated aperture 1744 in frame limb 1718 permits passage of link 1740, the aperture 1744 extending, of course, parallel to the slot guide 1726 of the slider 1728.

Upon rotation of shaft 1716 through full revolution (360°) the drive sliders 1728, 1730 are moved apart through a stroke equal to twice the eccentricity, with respect to the shaft axis 1746, of the points where links 1740 and 1742 are pivotably connected thereto, and thereafter the sliders approach each other again, so to execute one picture exchange operation. The possibilities for adapting a pre-determined stroke — as provided in this embodiment — to the different stroke requirements of magazines of different sizes have been discussed above and need not be repeated.

Figure 59 shows the front end of a magazine 1800 provided with an indentation hole 1802. This hole is laterally offset with respect to the plane of symmetry 1804 of the magazine and

serves the purpose of preventing insertion of the magazine into magazine holder 1806 (Figure 60) the wrong way.

A stop lever 1808 and a latch lever 1810 are pivotably connected to the magazine holder. The stop lever is biased into the position shown in Figure 60 by a tension spring 1812 so that it blocks the insertion of the magazine 1800. The stop lever is held in an incision 1814 of the latch lever at its end so that the magazine will be unable to push it aside; the magazine, on the contrary, must act on the sloped cam surface 1816 of the latch lever 1810 to pivot it away against the bias of a spring 1818 to free the stop lever. The required movement of the magazine, however, is possible only if its hole 1802 is aligned with a stop pin 1820 which is mounted on the stop lever 1808. This enabling position is indicated in Figure 60 in broken lines. If, inversely, the magazine is incorrectly inserted the front side of the magazine will abut the stop pin so that the latch lever cannot be acted upon.

The stop lever once unlocked gives away until it reaches an aperture 1822 in the magazine holder wall, and the latch lever, too, will yield sufficiently to permit the magazine to be pushed fully home. Upon magazine removal, the stop lever will follow due to the bias of its spring 1812 and will lock again in the incision 1814 of the latch lever which has also returned into the blocking position.

Figures 61 to 63 show an alternative design for the elements by which an incorrect insertion of the magazine may be prevented. The mark holes 1902 of magazine 1900 are offset with respect to the plane of symmetry 1904 in the front side of the magazine. The magazine holder 1906 has at each of its two narrow sides a lug 1908 with pivots 1910, 1912 offset with respect to each other, the pivots supporting a stop lever 1914 and a latch lever 1916, respectively. Stop lever 1914 is biased into its blocking position by a tension spring 1915 thereby retaining the latch lever, too, at which the stop lever abuts opposite an arriving magazine. A stop pin 1920 is disposed in the latch lever and may be displaced against bias of a spring 1918 (cf. Figure 63), the pins engaging the mark holes of the incoming magazine unless the latter has been introduced in an incorrect fashion. Proper orientation is illustrated in the left-hand side of Figure 62: the magazine may push away both levers 1914 and 1916 and be able to complete its insertion. If, conversely, the magazine is wrongly inserted (right-hand part of Figure 62), the stop pin 1920 is pushed through the latch lever downwards because the bias of spring 1918 is much smaller than that of tension spring 1916 so that, until pin 1920 has moved, the stop lever and the latch lever will remain in their blocking position. The blocking portion 1922 at the bottom end of pin 1920 extends, in this case, just in front of the free end of stop lever 1914 so that, because of the offset pivot points of the levers, they mutually block. Upon removal of the magazine the levers will return into their blocking position which is defined by a stop edge 1924 of a receiving slot

1926 for the levers when pivoted back.

Figures 64 to 67 show an alternative design to prevent the incorrect insertion of a magazine 2000, a mark groove 2002 providing the "information" concerning the orientation. The mark groove 2002 is "scanned" by means of a scan lever 2008 pivotably connected, at 2004, to a display lever 2006. Scan lever 2008 has a scanning arm 2010 which, if the magazine is properly orientated, may be pivoted into groove 2002 when a magazine engages with its leading side the stop arm 2012 of lever 2008 and tends to push it aside. If, however, the magazine was incorrectly orientated on insertion, scan lever 2008 cannot yield so that tension will act upon the display lever 2006 tending to elongate retaining spring 2014. While the display lever may be pivoted only about a small angle because of system 2018 of a display circuit permitting optical display or acoustic alarm to be initiated so to indicate to the user that the magazine has to be withdrawn, inverted, and inserted again in the correct orientation. The rest position of the display lever is defined by a counter stop member 2020; resetting of the scan lever 2008 is effected by a leaf spring 2022.

As mentioned above, the basic principle of the invention is also applicable to apparatus in which an image is not displayed but is projected onto light-sensitive material in order to produce a duplicate or a copy.

Examples of such top light projectors serving as copy printers are illustrated in Figures 68 to 74.

Figures 68 to 70 relate to a first embodiment. A magazine 3001 is pushed with its window side uppermost into an insert compartment 3002 of apparatus 3003, the uppermost picture in the magazine still being visible through control window 3004. Upon insertion of the magazine, coupling elements of a motor exchange drive system e.g. as shown in Figures 57, 58, will engage the frame members of the magazine so that, upon depression of a key 3006, the magazine is opened. The magazine is designed so that upon withdrawal of the exchange drawer 3007, the one picture of the picture stack in the magazine which previously was adjacent the magazine window is now the uppermost one in the withdrawn drawer, too. Such magazines are disclosed in the Specifications mentioned above.

The key 3006 commands the copying operation. Once the magazine is opened, the uppermost picture in the drawer is illuminated by lamps 3008, and an image thereof is formed by optical system 3009 on light sensitive material 3010. A set of digit keys 3005 permits setting of the number of copies to be produced on each depression of key 3006. In case of a picture not desired to be copied, the user has to depress key 3011 thereby causing simple actuation of the motor driven exchange without copying. Upon depression of a key 3012 the magazine is ejected from the compartment 3002 sufficiently to be gripped and drawn out by the user.

The light sensitive material, e.g. photo paper, is



withdrawn by a stroke equal to one picture width from a storage drum 3013 and, after exposure, fed to a development system (not shown) via a feed roller 3014.

5 The embodiment shown in Figures 71 and 72 is distinguished from that of the previous Figures in that the copier portion 3021 is housed in a movable slider which is shifted over an inserted magazine 3015 in direction of arrow 3023, the  
10 image being formed from the picture in the closed magazine. The number of copies desired may be set by appropriate turning of a switch knob 3019. The number as selected will appear, for check  
15 purpose, in a window 3031. The count of a counter is displayed at 3032, this number representing the total of copies produced. Alternatively, the total expense to be paid may be displayed or, in case of a vending machine, the excess amount of inserted money.  
20 In the embodiment of Figures 73 and 74 the magazine is inserted into the insert compartment with its viewing window facing downwards. At first, the picture adjacent the window is projected for checking onto a translucent screen plate 3040  
25 via mirrors 3037, 3038. Selection switch 3041 permits setting of the desired number of copies, and the copying operation is initiated by depressing a key 3042. For this operation, mirror 3037 is pivoted or shifted into position 3043, and the picture  
30 —uniformly illuminated by lamps 3036 — is reproduced by means of optical system 3045 on the light sensitive material 3046. In a case when no copy is desired, depression of a key 3047 will simply cause picture exchange. Upon depression of  
35 a key 3048 the magazine is ejected from the printer.

In the last two designs it will be noted that the edges of the picture to be copied are shielded by the frame areas of the magazine so that the image  
40 will be "trimmed". With a reproduction in 1:1 scale, therefore, a sort of passe-partout trimming will appear on the copy. Alternatively, one may select a slightly increasing scale corresponding to the size of said passe-partout so that the copies  
45 will have the same dimensions as the original.

It will be appreciated that details from one of the described embodiments of the invention may be employed in other embodiments to produce yet  
50 another alternative construction within the invention.

#### CLAIMS

1. An episcopes or in an incident-light direct picture viewer in which pictures in the form of sheets are stacked one above the other in a  
55 picture magazine with selected picture in the magazine exposed to light from a light source, the selected picture being uppermost in the stack and disposed against a window of the magazine for projection or viewing, the magazine comprising a  
60 first frame member and a second frame member which is relatively reciprocable parallel to the window for cyclic exchange of the uppermost picture within the magazine, and the episcopes or viewer includes a releasable holder by which one

65 of the frame members of the magazine is held in a position in which during projection or direct viewing the window of the magazine is exposed to the light source but the frame members remain relatively movable to enable picture exchange to  
70 be effected.

2. A device as claimed in claim 1, designed for the projection of an image of the picture onto a separate screen.

3. A device as claimed in claim 1, designed to project an image onto an integral screen plate.

75 4. A device as claimed in claim 1, including means to enable the selective projection of images onto a separate screen or onto an integral screen plate.

80 5. A device as claimed in any of the preceding claims, wherein the holder is designed to receive magazines of different format.

6. A device as claimed in claim 5, wherein for different magazine formats several projection  
85 optics are selectively operative such that the dimensions of the projected image are substantially equal in spite of different picture dimensions.

7. A device as claimed in claim 6, wherein the selection of the projection optics is automatically effected upon insertion of a magazine into the  
90 holder.

8. A device as claimed in any one of the claims 2 to 4, wherein the image screen or the screen  
95 plate is square having an edge corresponding to the maximum edge length of an image of a picture receivable in a magazine fitting into the holder.

9. A device as claimed in any one of the preceding claims for oblong pictures on which the image may be present in an upright format or a  
100 transverse format, including means for enabling the selective projection of the image in upright format or transverse format.

10. A device as claimed in claim 9 wherein the magazine holder is rotatable through at least 90°.

11. A device as claimed in claim 10, wherein the magazine exchange drawer is actuatable in each rotation position of the holder.

12. A device as claimed in claim 9, including an  
110 entire projection portion which is rotatable relative to a basic frame.

13. A device as claimed in claim 9 wherein the means for effecting an upright format/transverse format change includes optical means known per se for this purpose, the position of the magazine  
115 remaining unaltered.

14. A device as claimed in any one of the claims 9 to 13, wherein the pictures or their magazine bear a code and the device includes  
120 means for reading the code and effecting a change from upright format to transverse format selectively in response to the code.

15. A device as claimed in any of the preceding claims, including motor drive means connected to actuate the magazine exchange drawer.

16. A device as claimed in claims 9 and 15, wherein the motor drive includes means for actuation of the exchange drawer in upright format projection and transverse format

withdrawn by a stroke equal to one picture width from a storage drum 3013 and, after exposure, fed to a development system (not shown) via a feed roller 3014.

5 The embodiment shown in Figures 71 and 72 is distinguished from that of the previous Figures in that the copier portion 3021 is housed in a movable slider which is shifted over an inserted magazine 3015 in direction of arrow 3023, the  
10 image being formed from the picture in the closed magazine. The number of copies desired may be set by appropriate turning of a switch knob 3019. The number as selected will appear, for check purpose, in a window 3031. The count of a  
15 counter is displayed at 3032, this number representing the total of copies produced. Alternatively, the total expense to be paid may be displayed or, in case of a vending machine, the excess amount of inserted money.

20 In the embodiment of Figures 73 and 74 the magazine is inserted into the insert compartment with its viewing window facing downwards. At first, the picture adjacent the window is projected for checking onto a translucent screen plate 3040  
25 via mirrors 3037, 3038. Selection switch 3041 permits setting of the desired number of copies, and the copying operation is initiated by depressing a key 3042. For this operation, mirror 3037 is pivoted or shifted into position 3043, and the picture  
30 —uniformly illuminated by lamps 3036 — is reproduced by means of optical system 3045 on the light sensitive material 3046. In a case when no copy is desired, depression of a key 3047 will simply cause picture exchange. Upon depression of  
35 a key 3048 the magazine is ejected from the printer.

In the last two designs it will be noted that the edges of the picture to be copied are shielded by the frame areas of the magazine so that the image  
40 will be "trimmed". With a reproduction in 1:1 scale, therefore, a sort of passe-partout trimming will appear on the copy. Alternatively, one may select a slightly increasing scale corresponding to the size of said passe-partout so that the copies  
45 will have the same dimensions as the original.

It will be appreciated that details from one of the described embodiments of the invention may be employed in other embodiments to produce yet another alternative construction within the  
50 invention.

#### CLAIMS

1. An episcopes or in an incident-light direct picture viewer in which pictures in the form of  
55 sheets are stacked one above the other in a picture magazine with selected picture in the magazine exposed to light from a light source, the selected picture being uppermost in the stack and disposed against a window of the magazine for projection or viewing, the magazine comprising a  
60 first frame member and a second frame member which is relatively reciprocable parallel to the window for cyclic exchange of the uppermost picture within the magazine, and the episcopes or viewer includes a releasable holder by which one

65 of the frame members of the magazine is held in a position in which during projection or direct viewing the window of the magazine is exposed to the light source but the frame members remain relatively movable to enable picture exchange to  
70 be effected.

2. A device as claimed in claim 1, designed for the projection of an image of the picture onto a separate screen.

3. A device as claimed in claim 1, designed to  
75 project an image onto an integral screen plate.

4. A device as claimed in claim 1, including means to enable the selective projection of images onto a separate screen or onto an integral screen  
80 plate.

5. A device as claimed in any of the preceding claims, wherein the holder is designed to receive  
85 magazines of different format.

6. A device as claimed in claim 5, wherein for different magazine formats several projection  
90 optics are selectively operative such that the dimensions of the projected image are substantially equal in spite of different picture dimensions.

7. A device as claimed in claim 6, wherein the  
95 selection of the projection optics is automatically effected upon insertion of a magazine into the holder.

8. A device as claimed in any one of the claims 2 to 4, wherein the image screen or the screen  
100 plate is square having an edge corresponding to the maximum edge length of an image of a picture receivable in a magazine fitting into the holder.

9. A device as claimed in any one of the preceding claims for oblong pictures on which the  
105 image may be present in an upright format or a transverse format, including means for enabling the selective projection of the image in upright format or transverse format.

10. A device as claimed in claim 9 wherein the  
110 magazine holder is rotatable through at least 90°.

11. A device as claimed in claim 10, wherein the magazine exchange drawer is actuatable in each  
115 rotation position of the holder.

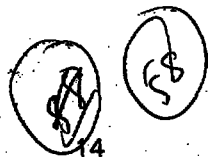
12. A device as claimed in claim 9, including an  
120 entire projection portion which is rotatable relative to a basic frame.

13. A device as claimed in claim 9 wherein the means for effecting an upright format/transverse  
125 format change includes optical means known per se for this purpose, the position of the magazine remaining unaltered.

14. A device as claimed in any one of the claims 9 to 13, wherein the pictures or their  
130 magazine bear a code and the device includes means for reading the code and effecting a change from upright format to transverse format selectively in response to the code.

15. A device as claimed in any of the preceding claims, including motor drive means connected to  
135 actuate the magazine exchange drawer.

16. A device as claimed in claims 9 and 15, wherein the motor drive includes means for actuation of the exchange drawer in upright  
140 format projection and transverse format



projection.

17. A device as claimed in claim 16, wherein the motor drive exchange drawer actuation means is operable in four positions of the magazine holder at 90° with respect to each other.

18. A device as claimed in any of claims 9 to 14 and 15 to 17 including remote control means for effecting the format changing and/or picture exchange operations.

19. A device as claimed in any of the preceding claims, wherein the magazine comprises a spring biased pressure means for urging the picture stack and, thus, the picture to be projected against the window of the magazine.

20. A device as claimed in claim 19, wherein the bias pressure means is disabled during an exchange drawer actuation.

21. A device as claimed in claim 19 or 20, wherein the bias pressure means is designed for exerting pressure on the picture to be projected substantially independent of the height of the picture stack.

22. A device as claimed in any of the preceding claims, wherein the holder includes locking means engageable by a magazine, said locking means being designed such that the magazine during the exchange drawer actuation is not movable in the plane of the magazine window or transversely thereto.

23. A device as claimed in claim 22, wherein the locking means may be unlocked by depressing a key or remotely.

24. A device as claimed in claim 22 or 23, wherein the holder includes an ejecting device which upon unlocking of the locking means conveys the magazine to a removal position.

25. A device as claimed in claim 5, 6 or 7, wherein the holder is constructed to adapt itself automatically to the magazine dimensions.

26. A device as claimed in claim 25 wherein the holder is steplessly adaptable to the magazine dimensions.

27. A device as claimed in claim 25 or 26 and claim 22, 23 or 24 wherein the magazine may be locked by said locking means independent of its dimensions such that the magazine window is disposed so that the centre of the image is formed at substantially the same position.

28. A device as claimed in any of claims 25 to 27, wherein the holder comprises spring biased guide means able to yield upon insertion of a magazine.

29. A device as claimed in claim 28 wherein the guide means include diaphragm members.

30. A device as claimed in any of the preceding claims, wherein the magazine has a window covered by a transparent sheet which is opened upon insertion of the magazine into the holder so that the picture to be projected can abut against a glass plate.

31. A device as claimed in claim 30, wherein the transparent sheet is slidable parallel to the glass plate.

32. A device as claimed in any of the preceding claims in which a magazine carries sound

information stored by a sound carrier preferably housed in said magazine and the device includes a sound reproducing system arranged to co-operate with the sound carrier when the magazine is inserted into the holder.

33. A device as claimed in claim 32, wherein sound reproducing system is controlled by the magazine drawer movement.

34. A device as claimed in claim 32 or 33, wherein the sound carrier stores a control signal by means of which upon termination of the replaying of part of the sound information causes actuation of the picture exchange drawer of the magazine.

35. A device as claimed in claim 32, 33 or 34 wherein the sound reproduction is remotely controlled.

36. A device as claimed in any of the preceding claims, wherein the holder is arranged and the magazine designed so that a recently projected picture is immediately accessible upon at least partial actuation of the exchange drawer.

37. A device as claimed in any one of claims 1 to 29 wherein the magazine window is closed by a transparent plate through only which the uppermost picture is exposed for projection.

38. A device as claimed in any of the preceding claims, wherein the holder has a magazine compartment with an automatically operative exchange mechanism for magazines stored in a reservoir of magazines.

39. A device as claimed in claims 24 and 28, wherein the magazine can be ejected by means of the bias spring of one of the guide means.

40. A device as claimed in any of the preceding claims, including a transparent plate against which a picture to be displayed is pressed and means for cleaning the plate upon each magazine exchange.

41. A device as claimed in any of the preceding claims, including air circulation means for cooling off the projection light source in which a portion of the cooling air is passed across the magazine.

42. A device as claimed in any of the preceding claims, including means for disabling the projection of the image during actuation of the magazine exchange drawer and/or during the switching between upright format / transverse format.

43. A device as claimed in claim 16, wherein the holder includes two sliders movable in opposite directions and respectively connected to the frame member of the magazine.

44. A device as claimed in claim 43, in which the sliders carry control cams engaging elliptic guide tracks in a rotatable member so that upon each half revolution of the member a picture exchange will take place.

45. A device as claimed in claim 44 wherein for a change upright format to transverse format the sliders are rotatable simultaneously with the rotatable member through an angle of 90°.

46. A device as claimed in claim 45, including means for locking the sliders against rotation when a picture exchange is required.

47. A device as claimed in claim 45 or 46,



- including a common drive motor for the rotation of the rotatable member only or for the rotatable member together with the sliders.
48. A device as claimed in any of claims 44 to 47, wherein the rotatable member comprises a circumferentially journaled disc provided with a central opening for the passage of light.
49. A device as claimed in any of the claims 43 to 48, in which the sliders are arranged to receive magazines of different sizes with automatic adjustment of the picture exchange stroke.
50. A device as claimed in any of the preceding claims, including motor drive means for effecting the picture exchange which means is fixed in the housing of the device and has coupling elements able to be coupled to the frame members of an inserted magazine in only one rotational position of a rotatable magazine holder.
51. A device as claimed in claim 50, wherein the frame members and said coupling elements are able to be coupled in response to an actuating control signal.
52. A device as claimed in claim 50 or 51, wherein the coupling is a forcefit.
53. A device as claimed in claim 50 or 51, wherein the coupling is a positive connection.
54. A device as claimed in claim 52 wherein said coupling elements are designed to engage the frame members at their window side and there rear side.
55. A device as claimed in claim 52, wherein the coupling elements are designed to engage the frame members at their edges extending parallel to their displacement direction.
56. A device as claimed in claim 54 or 55, wherein the coupling elements are of the gripper type.
57. A device as claimed in claim 52 in which the coupling elements are magnetic.
58. A device as claimed in claim 53 wherein the coupling elements are designed to engage at the rear side of the frame members remote from the window.
59. A device as claimed in claim 58, wherein the frame members have indentations engageable by extensions of the coupling elements.
60. A device as claimed in claim 59 wherein the indentations are disposed in a central plane of the frame member displacement.
61. A device as claimed in claim 59, wherein the indentations are similarly located relative to one another on magazines having different sizes.
62. A device as claimed in claim 59, wherein the indentations are disposed symmetrically with respect to the centre of the window.
63. A device as claimed in claim 50, wherein the motor drive is adaptable to different strokes of the relative displacement of the frame members of the magazines.
64. A device as claimed in claims 51 and 63, wherein the coupling to the frame members of the magazine to effect the picture exchange stroke is effective to adjust the stroke to that required by the particular magazine.
65. A device as claimed in claim 64, wherein the motor drive is designed for a maximum stroke and the coupling comprises a take-up element for the stroke difference for magazines requiring smaller strokes.
66. A device as claimed in claim 65, wherein the take-up element is disposed at the magazine.
67. A device as claimed in claim 66, wherein the take-up element permits a lost motion stroke corresponding to the stroke difference.
68. A device as claimed in claims 59 and 67, wherein the indentations are in the form of slots in the magazines having smaller format, the slot holes having a length depending on the stroke difference to be taken up.
69. A device as claimed in claim 65, wherein the take-up element is disposed in the coupling.
70. A device as claimed in claim 69, wherein the coupling element is an elastic member which is resilient at least within the limit of the stroke difference.
71. A device as claimed in claim 64, including a control member responsive to the stroke adjustment required.
72. A device as claimed in claim 64, including a control member responsive to the displacement force used to effect the stroke.
73. A device as claimed in claim 71 or 72, wherein the control member is connected to effect the direction reversal of the motor drive.
74. A device as claimed in claims 57 and 64, wherein the magnetic force is greater than that necessary to overcome the friction occurring during relative displacement of the frame members of the magazine, but is smaller than the holding force exerted by the holder on to the magazine and the part of the magnetic element attached to the coupling makes a longer stroke than the stroke of the magazine.
75. A device as claimed in claim 50, including an adapter to adapt the holder to magazines having a width smaller than the maximum receiving width of the holder in direction transverse to the relative displacement of the frame members.
76. A device as claimed in claim 75, wherein the adapter is detachable.
77. A device as claimed in claim 50, wherein the holder is rotatable relative to the motor drive.
78. A device as claimed in claims 51 and 77, wherein the holder is rotatable relative to the coupling.
79. A device as claimed in claim 77 or 78, wherein the holder is rotatable through 90° only.
80. A device as claimed in claim 75, wherein the magazine is insertable into a removable from the holder in a position of the holder rotated relative to the one drive position.
81. A device as claimed in claim 77, wherein the non-rotated position of the holder provides transverse format projection in case of non-square pictures.
82. A device as claimed in claims 51 and 77, wherein the coupling is designed to disengage automatically upon rotation of the magazine.
83. A device as claimed in claims 50 and 77,



wherein the exchange drive and the rotation drive are provided by a common motor.

84. A device as claimed in claim 83, wherein the motor also drives a cooling fan.

5 85. A device as claimed in claim 50 or 83, wherein the motor provides drive in one direction only and the drive in counter-direction is caused by a power storage means charged by the motor.

10 86. A device as claimed in claim 78, wherein the exchange drive and the rotation drive are mutually exclusive.

87. A device as claimed in any of claims 50 to 86, wherein the rotation of the magazine occurs completely within the housing.

15 88. A device as claimed in claim 50, wherein the coupling is arranged so that the picture exchange occurs when the magazine is in the position in which the projected picture is in the transverse format.

20 89. A device as claimed in claim 88, wherein the holder position is rotated from that in which the projected picture is in the upright format into one in which the projected picture is in the transverse format for the exchange movement.

25 90. A device as claimed in any of claims 50 to 89, wherein the coupling is arranged to provide a displacement of both frame members by half the stroke length to give a relative displacement equal to the stroke.

30 91. A device as claimed in any of claims 50 to 89, wherein for the exchange movement one frame member remains stationary in the holder and the exchange mechanism comprises a coupling connected to the other frame member only and reciprocating through the full stroke.

35 92. A device as claimed in any of claims 50 to 91, wherein the holder on the one hand and the magazine on the other hand have engagable and disengageable alignment means for defining the window centre.

40 93. A device as claimed in claim 92, in which the magazine includes disabling means to prevent its improper insertion onto the holder.

45 94. A device as claimed in any of claims 50 to 93 without claim 87, wherein the housing has an opening through which part of at least one frame member protrudes during an exchange movement.

50 95. A device as claimed in claim 94, including a guiding member for the said at least one frame member fastened in the area of the opening, said guiding member being preferably housed in the housing in the out-of-service status of the device.

55 96. A device as claimed in any of claims 50 to 95, including a light source arranged and located so that there is illuminated a square field having an edge length corresponding to the greatest window of magazines of different format in the vicinity of the window of a magazine inserted in the device.

60 97. A device as claimed in claim 96, wherein the window centre of all magazines of different format are arranged to be disposed in the centre of the illuminated field.

65 98. A device as claimed in claim 97, wherein parts of the illuminated field around the window of

an inserted magazine are shielded by diaphragms.

99. A device as claimed in any of claims 50 to 98, wherein the housing is approximately a rectangular block and the magazine is disposed with its window containing surface parallel to one of the housing faces and the inner dimensions of this face of housing are in one direction about equal to the longest dimension of the closed magazine and in the direction perpendicular thereto about equal to the longest dimension of the fully open magazine.

100. A device as claimed in any of claims 50 to 99, wherein the holder is open at at least one of its front faces and is disposed in or may be brought into alignment with an opening in the housing for the insertion and removal of magazines.

101. A device as claimed in claim 100, wherein the holder is open at both front sides and both frame members are displaceable relative to the holder through said openings during the exchange motion.

102. A device as claimed in any of claims 50 to 101, including a mechanism by means of which a magazine inserted into the holder may be brought into the preferred transverse-format projection position prior to projection.

103. A device as claimed in any of claims 50 to 102, including a magazine ejecting system actuatable only if the magazine is aligned with an ejection opening in the housing.

104. A device as claimed in claim 103, including a flap compartment in the holder into which the magazine may be laid or pushed.

105 105. A device as claimed in claim 104, wherein the flap compartment is rotatable together with the holder and may be opened and closed by a pivoting movement in each rotation position.

106. A device as claimed in any of claims 50 to 103, including insert and ejection compartment for the magazine disposed in the housing and easily manually accessible.

107. A device as claimed in any of claims 50 to 106, wherein the coupling is motor driven for one stroke of the frame member while the reverse stroke occurs by means of a spring biased by the motor drive.

108. A device as claimed in claim 51, wherein the coupling engages after or upon insertion of the magazine and disengages prior to or with the ejection of the magazine.

109. A device as claimed in claim 51, wherein the coupling disengages upon rotation of the rotor relative thereto and engages upon return rotation into the exchange drive position.

110. A device as claimed in any of claims 50 to 109, wherein upon actuation of the exchange mechanism the holder is initially automatically returned to a rotational position for effecting the exchange if not already in such a position.

111. A device as claimed in claims 52 and 56, wherein frame members are accessible for a pressfit gripping by the coupling elements at two opposite positions and the magazine is designed to be sufficiently rigid to enable the press-fit to exert a sufficiently large force.



112. A device as claimed in claim 50, wherein the coupling elements are entrainment rollers or drums driven to rotate and frictionally engageable with the frame members.

5 113. A device as claimed in claim 112, wherein the rollers or drums are motor or manually driven in the opening or closing direction by the force of spring means.

10 114. A device as claimed in claim 50, wherein the coupling elements are linearly movable and frictionally engageable with the frame members.

15 115. A device as claimed in claim 53, wherein the positive connection elements of the exchange mechanism are manually adjustable with respect to the co-operative elements of magazines having different formats, co-operating elements not being in the same relative position on magazines for different formats, said latter being non-congruent.

20 116. A device as claimed in claim 53, wherein the positive connection elements of the exchange mechanism are adjusted to fit the co-operating elements of the magazines having different formats in response to the insertion of the magazine.

25 117. A device as claimed in claim 53, including an adapter insertable into the holder and comprising a stroke gearing system for magazines requiring different strokes.

30 118. A device as claimed in claim 117, wherein each magazine of different format has co-operating elements disposed differently from those of other formats and the adapter insert comprises the positive connection elements of the coupling elements which describe the correct stroke.

35 119. A device as claimed in any of claims 80 to 118, wherein the adapters which fit into the holder for magazines for different formats include diaphragm portions for shielding the illumination field areas outside the magazine window.

40 120. A device as claimed in any of claims 50 to 118, wherein format adaption diaphragms are disposed in the projection beam path, said diaphragms being rotatable in synchronism with the rotation of the holder and automatically or manually displaceable to adapt to magazines of different format.

45 121. A device as claimed in any of claims 50 to 120, wherein the holder is rotatable about an axis perpendicular to the centre of the window, and the holder has a hub bearing at the side remote from the window.

50 122. A device as claimed in any of claims 50 to 121, wherein the holder is rotatable about an axis perpendicular to the window centre, and the holder comprises a rotatable dish or part thereof or is mounted thereon, said dish being rotatably journaled at its circumference.

55 123. A device as claimed in any of claims 50 to 120, wherein the holder is non-rotatable and the change between transverse format and upright format is made by optical means.

60 124. A device as claimed in claim 123, wherein said optical means comprises prisms selectively insertable into the beam path.

125. A device as claimed in claim 124, wherein the prisms are insertable into the beam path at the side of the projection optics remote from the mirror system.

70 126. A device as claimed in claim 123, wherein the optical means comprises glass fibre optics, selectively insertable into the beam path.

75 127. A device as claimed in any of claims 50 to 126, including a switch for the light source which is switched on in response to insertion of the magazine and switched off in response to the removal of the magazine.

80 128. A device as claimed in any of claims 50 to 127, wherein the light source is arranged to be switched off or shielded during the picture exchange and/or during rotation of the holder.

85 129. A device as claimed in any of claims 50 to 128, including a pilot lamp of low power relative to that of the light source, said pilot lamp serving to illuminate the magazine insert opening.

90 130. A device as claimed in any of claims 50 to 129, wherein the housing has stationary magazine guide means to align the magazine with the holder during insertion.

95 131. A device as claimed in any of claims 50 to 130 for selective transverse and upright format projection, including a format key which when actuated provides projection in the one selected projection format independent of the position of the magazine necessary for picture exchange.

100 132. A device as claimed in any of claims 50 to 131, wherein a magazine for non-square rectangular pictures is arranged to be pushed with its narrow ends as leading edge into an insertion compartment provided in the housing where the holder receives the magazine in its orientation provided for the upright format projection, the holder turning immediately into the transverse format orientation wherein the coupling elements engage.

105 133. A device as claimed in any of claims 50 to 132, including a magazine ejection mechanism acting upon the narrow edge of the magazine disposed in the housing so that it is arranged to be brought in operative connection with the magazine in a rotational position of the holder different from that provided for picture exchange.

110 134. A device as claimed in any of claims 50 to 132, including a magazine ejection mechanism disposed by the holder which is arranged to act upon the magazine outside the frame member displacement path.

115 135. A device as claimed in any of claims 50 to 134, wherein the housing has a receptacle for format adaptation diaphragms.

120 136. A device as claimed in any of claims 50 to 135, wherein the insertion opening for the magazine into the holder is accessible via a lid which is otherwise closed to seal out dust.

125 137. A device as claimed in claim 50, in which the exchange mechanism comprises a twin crank shaft whose axis is disposed coaxially with respect to the axis of rotation of the magazine holder.

130 138. A device as claimed in claim 137, wherein the twin crank shaft and the linkage means

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connected thereto are mounted at a common frame which, in turn, is mounted as a sub-assembly in the housing.

- 5 139. A device as claimed in claim 93, wherein said disabling means comprises a check indentation on the magazine disposed therein offset with respect to a plane of symmetry of the magazine, and said holder is provided with scanning means arranged to engage into said
- 10 check indentation only if the magazine has been inserted properly orientated.

140. A device as claimed in claim 139 wherein the scanning means comprises a stop lever which is releasably retained in a position in which it
- 15 blocks the further insertion of a magazine but is releasable upon engagement by said scanning

means with said check indentation.

141. A device as claimed in claim 140, wherein said scanning means comprises a contact
- 20 connected into a display circuit, said contact being actuated upon incorrectly orientated insertion of a magazine into the holder.

142. A device as claimed in claim 1, including a copy printer arranged to reproduce pictures
- 25 housed in said magazine, the printer being provided with motor drive means to move said magazine frame members.

143. An episcope or picture viewer device according to claim 1 and including any feature or
- 30 features illustrated in, or described herein with reference to, any Figure or Figures of the accompanying drawings.

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