

SPECIFICATION **Improvements In and Relating to Microfilm** **Readers**

The invention relates to microfilm readers with
5 a cylindrical objective support coaxial with the
optical system, an objective which is guided in the
said objective support and is axially displaceable
relative to the latter and means for the relative
displacement of the objective support and the
10 objective in an axial direction.

Objective retaining devices of the above-
mentioned type are already known in which the
objective tube is guided in the objective support
by means of a screw thread or a helical groove, so
15 that in order to focus the objective onto the
microimage which is to be projected the objective
is rotated accordingly, whereupon the objective is
displaced in an axial direction with respect to the
objective support.

20 An object of the present invention, however, is
to create an objective retaining device for
microfilm readers of the type mentioned initially
in which the angular position of the objective is
not altered when the latter is focussed.

25 The invention provides a microfilm reader
comprising an objective support, an objective
which is secured to a mount that is non-rotatably
guided in the objective support and is
displaceable relative to the latter in the direction
30 of the optical axis, an adjusting means that is so
supported on the objective support as to be
rotatable about the objective axis and which
brings about the displacement of the objective in
an axial direction relative to the objective support
35 when it is so rotated and a rotary prism which is
rotatable about the optical axis and is supported
on the objective mount. The adjusting means
advantageously comprises a ring substantially
encircling a cylindrical portion of the objective
40 support. Advantageously, the objective mount
comprises a hollow tube having a cylindrical, and
preferably right circular cylindrical, outer face, and
the objective tube has a corresponding cylindrical
inner face. The adjusting means and the objective
45 mount advantageously co-operate with one
another by way of a pin and slot connection, with
the slot extending helically about the optical axis,
and the objective mount and the objective
support advantageously co-operate with one
50 another by way of a further pin and slot
connection, with the slot extending parallel to the
optical axis.

By this means, rotation of the objective during
focussing is avoided in a simple manner, and the
55 objective constantly maintains the same angular
position relative to the apparatus. When
assembling the objective lenses in the objective
mount it is therefore possible to align the lenses
in such a way that any lens errors occurring in the
60 edge portions of the objective lenses are
prevented as far as possible from being included
in the projection field which is visible on the
projection screen and is normally rectangular.

Advantageously, the adjusting means has a
65 slot which extends helically about the optical axis
and in which there is guided a pin on the objective
mount, and also advantageously the slot
extending parallel to the optical axis is formed in
the objective support, and a pin on the objective
70 mount is guided in the latter slot. Preferably the
same pin on the objective mount is guided both in
the slot formed in the objective support and in the
slot formed in the adjusting means.

In order to make it possible to exchange the
75 objectives, advantageously the slot in the
objective support extends to one end thereof and
the adjusting means has an opening which at one
relative position of the objective support and the
adjusting means permits the pin to be introduced
80 into the helical slot in the adjusting means.
Advantageously a locking means which takes
effect between the adjusting means and the
objective support is provided for locking the
adjusting means in the position in which the pin
85 can be introduced into the slot in the adjusting
means, so that the position of the adjusting
means in which the objective can be removed
may easily be felt during displacement of the
adjusting means, and in addition this position is
90 secured against accidental movement.

Preferably, a stop is provided which is
adjustable between a condition in which it
prevents the setting of the adjusting means to the
position in which the pin can be introduced into
95 the slot in the adjusting means and a position in
which it does not prevent the adjusting means
from being so set, and preferably may optionally
be brought into the rotation path of the adjusting
ring. Preferably the stop is a stop pawl which is
100 pivotally supported on the objective support, is
held in its operating position by means of a spring
force, and can be pivoted onto its liberating
position by way of a lever formed on the stop
pawl. The stop pawl may be spring biased. The
105 use of such an arrangement ensures that the
adjusting means cannot be brought into the
position for removal of the objective
unintentionally by the user, and thus prevents the
objective from falling out of the objective support
110 accidentally, for example whilst the apparatus is
being transported, and thus being damaged. In
addition, these measures offer a certain degree of
protection against unauthorised removal of the
objective.

115 The use of a non-rotatably supported objective
is also of considerable advantage if the microfilm
apparatus is to be provided with a rotary prism by
means of which the projection image appearing
on the projection screen can be rotated into any
120 required angular position. In the objective
retaining device of the invention, the objective
mount carries the rotary prism, which was not
possible with the hitherto-known objective
retaining devices in which the rotary prism would
125 of necessity be rotated with the objective when
the latter was focussed. The advantage of having
a rotary prism supported on the objective mount
lies in a simpler construction of the apparatus,

and especially the saving of a separate support for the rotary prism. Furthermore, as a result of the proposed supporting of the rotary prism the latter is reliably and necessarily adjusted in the simplest manner on the optical axis of the projection objective.

Two forms of microfilm reader constructed in accordance with the invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is an exploded diagrammatic perspective view of part of the first form of reader including the objective and rotary prism;

Fig. 2 is a perspective view of the assembled adjusting ring of the reader shown in Fig. 1; and

Fig. 3 shows in side elevation part of the second form of reader.

Referring to Fig. 1, the first form of reader comprises a substantially right circular hollow cylindrical objective support, which is indicated generally by the reference numeral 10, and is supported by way of bearing bolts 11 and 12 on lugs 21 and 22 of two arms 23 and 24 of a resilient support plate 20. A support system of this type ensures that the underside of the objective support 10 rests evenly on the transparent cover plate of a micro-fiche platform which is not shown. The general structure of a suitable micro-fiche reader is described, for example, in DE-OS 26 32 934.

The central hole of the cylinder 10 receives an objective tube 30 carrying the objective. When the device is assembled in the microfilm reader, the axis 60 of the cylinder is also the optical axis of the system. The objective support 10 has a groove 13 formed in its inner face parallel to the axis 60 and extending from the top surface, as defined with respect to the normal working orientation of the microfilm reader and as seen in the drawings, of the objective support, and a broad groove 15 formed in its outer face near the bottom end completely encircling the objective support. The grooves are so arranged that the bottom end of the groove 13 is at or just above the bottom edge of the groove 15, and the sum of the depths of the two grooves is substantially greater than the thickness of the objective support 10 between its inner and outer faces so that where the two grooves overlap an open slot 14 is formed. The objective tube 30, which has a right circular cylindrical outer face that substantially conforms to the inner face of the objective support 10, carries a guide pin 31 extending radially outwards from its outer face, which when the objective tube is inserted into the hole in the objective support is received in and guided by the groove 13 and when the objective tube 30 is in its operating position projects through the slot 14 into the groove 15.

The groove 15 receives an adjusting ring, indicated by the reference numeral 40, which is composed of two halves, indicated generally by the reference numerals 41 and 42. The assembled adjusting ring is shown in Fig. 2 of the drawings. The ring has a concave cylindrical inner

face substantially conforming in both width and radius to the base of the groove 15. The half-ring 41 has a radially outwardly extending actuating lever 47 and has near each end a radially outwardly extending pin 44. The half-ring 42 has two end-portions of which at least the inner faces are stepped back and in each of which there is a hole 45, the arrangement being such that when the ring is assembled the end-portions of the half-ring 42 overlap the end portions of the half-ring 41 and the pins 44 engage with the holes 45 to hold the ring 40 together. One of the steps in the half-ring 42 is so spaced away from the end that an axially extending channel 61 is formed between the end of the half-ring 41 and the step. A slot 46 in the half-ring 42 extends from the channel 61 helically upwardly around part of the circumference of the half-ring.

When the ring 40 is assembled round the objective support 10, a stop lug 43 extends downwards from the half-ring 41 into a recess 16 in the lower side face of the groove 15, so that the ring 40 can rotate around the objective support through an arc limited by the engagement of the stop lug 43 with the ends 17 and 18 of the recess 16. The arrangement is such that when the stop lug 43 is engaged with the end 17 of the recess 16, the channel 61 is over the open slot 14 in the objective support 10, and the objective tube 30 can slide up and down in the support 10 with the pin 31 guided in the slot 14 and the channel 61 or in the groove 13. When the pin 31 is at the bottom of the slot 14, it is level with the bottom end of the guide slot 46, where the guide slot opens into the channel 61. The adjusting ring is locked in this position by a locking projection 19 which is formed in the bottom of the recess 16 and engages the stop lug 43.

If the adjusting ring 40 is now rotated by way of the actuating lever 47, the guide pin 31, and thus the objective tube 30 carrying the latter, is lifted up by running onto the ramp 48 formed by the lower side of the guide slot 46. After the adjusting ring has been rotated out of its locked position, it is no longer possible to remove the objective because the pin 31 is held by both slots 14 and 16.

The objective tube 30 has an opening 32 at the top to receive a rotary prism which is indicated generally by the reference numeral 50. The rotary prism 50 may be inserted into the objective tube and is rotatably supported about the optical axis 60 when inserted. By way of a gearwheel 52 attached to a mount 51 for the rotary prism, the rotary prism can be rotated into any required angular position by means of an adjusting wheel which meshes with the gearwheel 52, is accessible from outside the reading apparatus, and is not shown.

Referring now to Fig. 3, the second form of device is the same as that shown in Figs. 1 and 2 except that it also has a locking pawl 62 provided with an operating lever 65. The locking pawl 62 is pivotally supported on the objective support 10 by a pin 63. A hair pin spring 64 engages at one

end with the locking pawl 62 and with the objective support 10 at its other end. The hairpin spring 64 forces the locking pawl 62 into a position such that one end portion 62a of the locking pawl is situated in the path of movement of the stop lug 43, which in this embodiment projects radially outwards beyond the outer face of the objective support 10. The adjusting ring 40 can therefore not assume, unless the locking pawl 62 is moved aside, the locked position in which the objective can be removed. The advantage of this arrangement is that the objective cannot slide out of the retaining device accidentally, for example when the apparatus is being transported. In addition, the arrangement also offers a certain degree of protection against theft of the objectives.

If the objective is to be exchanged, the operating lever 65 must first be pivoted in the direction of the arrow A, whereby the pawl 62 is removed from the path of the stop lug 43. The adjusting ring can then be moved into its locking position and the objective can be removed.

Claims

1. A microfilm reader comprising an objective support, an objective which is secured to a mount that is non-rotatably guided in the said objective support and is displaceable relative to the latter in the direction of the optical axis, an adjusting means that is so supported on the objective support as to be rotatable about the objective axis and which brings about the displacement of the objective in an axial direction relative to the objective support when it is so rotated, and a rotary prism which is rotatable about the optical axis and is supported on the objective mount.

2. A microfilm reader as claimed in claim 1, wherein the adjusting means comprises a ring substantially encircling a cylindrical portion of the objective support.

3. A microfilm reader as claimed in claim 1 or claim 2, wherein the objective mount comprises a hollow tube having a cylindrical outer face, and the objective support has a corresponding cylindrical inner face.

4. A microfilm reader as claimed in claim 3, in which the said cylindrical faces are right circular cylindrical faces.

5. A microfilm reader as claimed in any one of claims 1 to 4, wherein the adjusting means and the objective co-operate by way of a pin and slot connection, in which the slot extends helically about the optical axis.

6. A microfilm reader as claimed in claim 5, wherein the adjusting means has a slot which extends helically about the optical axis and in

which a pin on the objective mount is guided.

7. A microfilm reader as claimed in any one of claims 1 to 6, wherein the objective and the objective support co-operate by way of a pin and slot connection, in which the slot extends parallel to the optical axis.

8. A microfilm reader as claimed in claim 7, wherein the slot which extends parallel to the optical axis is formed in the objective support, and a pin on the objective mount is guided in the said slot.

9. A microfilm reader as claimed in claim 6 and claim 8, wherein the same pin on the objective mount is guided both in the slot formed in the objective support and in the slot formed in the adjusting means.

10. A microfilm reader as claimed in claim 8, wherein the slot in the objective support extends to one end thereof, and the adjusting means has an opening which at one relative position of the objective support and the adjusting means allows the pin to be introduced into the slot in the adjusting means.

11. A microfilm reader as claimed in claim 10, wherein a locking means which takes effect between the adjusting means and the objective support is provided for locking the adjusting means in the position in which the pin can be introduced into the slot in the adjusting means.

12. A microfilm reader as claimed in claim 10 or claim 11, wherein a stop is provided which is adjustable between a condition in which it prevents the adjusting means from being set to the position in which the pin can be introduced into the slot in the adjusting means and a position in which it does not prevent the adjusting means from being so set.

13. A microfilm reader as claimed in claim 12, wherein the stop is a stop pawl which is pivotably supported on the objective support, is resiliently biased into its preventive position, and can be pivoted into its liberating position.

14. A microfilm reader as claimed in claim 13, wherein the stop pawl is biased by a spring.

15. A microfilm reader as claimed in any one of claims 1 to 14, wherein the rotary prism is retained on the objective tube by its own weight.

16. A microfilm reader substantially as hereinbefore described with reference to, and as shown in, Figs. 1 and 2 of the accompanying drawings.

17. A microfilm reader substantially as hereinbefore described with reference to, and as shown in, Figs. 1 and 2 of the accompanying drawings modified substantially as hereinbefore described with reference to, and as shown in, Fig. 3 of the accompanying drawings.



25

end with the locking pawl 62 and with the objective support 10 at its other end. The hairpin spring 64 forces the locking pawl 62 into a position such that one end portion 62a of the locking pawl is situated in the path of movement of the stop lug 43, which in this embodiment projects radially outwards beyond the outer face of the objective support 10. The adjusting ring 40 can therefore not assume, unless the locking pawl 62 is moved aside, the locked position in which the objective can be removed. The advantage of this arrangement is that the objective cannot slide out of the retaining device accidentally, for example when the apparatus is being transported. In addition, the arrangement also offers a certain degree of protection against theft of the objectives.

If the objective is to be exchanged, the operating lever 65 must first be pivoted in the direction of the arrow A, whereby the pawl 62 is removed from the path of the stop lug 43. The adjusting ring can then be moved into its locking position and the objective can be removed.

Claims

1. A microfilm reader comprising an objective support, an objective which is secured to a mount that is non-rotatably guided in the said objective support and is displaceable relative to the latter in the direction of the optical axis, an adjusting means that is so supported on the objective support as to be rotatable about the objective axis and which brings about the displacement of the objective in an axial direction relative to the objective support when it is so rotated, and a rotary prism which is rotatable about the optical axis and is supported on the objective mount.

2. A microfilm reader as claimed in claim 1, wherein the adjusting means comprises a ring substantially encircling a cylindrical portion of the objective support.

3. A microfilm reader as claimed in claim 1 or claim 2, wherein the objective mount comprises a hollow tube having a cylindrical outer face, and the objective support has a corresponding cylindrical inner face.

4. A microfilm reader as claimed in claim 3, in which the said cylindrical faces are right circular cylindrical faces.

5. A microfilm reader as claimed in any one of claims 1 to 4, wherein the adjusting means and the objective co-operate by way of a pin and slot connection, in which the slot extends helically about the optical axis.

6. A microfilm reader as claimed in claim 5, wherein the adjusting means has a slot which extends helically about the optical axis and in

which a pin on the objective mount is guided.

7. A microfilm reader as claimed in any one of claims 1 to 6, wherein the objective and the objective support co-operate by way of a pin and slot connection, in which the slot extends parallel to the optical axis.

8. A microfilm reader as claimed in claim 7, wherein the slot which extends parallel to the optical axis is formed in the objective support, and a pin on the objective mount is guided in the said slot.

9. A microfilm reader as claimed in claim 6 and claim 8, wherein the same pin on the objective mount is guided both in the slot formed in the objective support and in the slot formed in the adjusting means.

10. A microfilm reader as claimed in claim 8, wherein the slot in the objective support extends to one end thereof, and the adjusting means has an opening which at one relative position of the objective support and the adjusting means allows the pin to be introduced into the slot in the adjusting means.

11. A microfilm reader as claimed in claim 10, wherein a locking means which takes effect between the adjusting means and the objective support is provided for locking the adjusting means in the position in which the pin can be introduced into the slot in the adjusting means.

12. A microfilm reader as claimed in claim 10 or claim 11, wherein a stop is provided which is adjustable between a condition in which it prevents the adjusting means from being set to the position in which the pin can be introduced into the slot in the adjusting means and a position in which it does not prevent the adjusting means from being so set.

13. A microfilm reader as claimed in claim 12, wherein the stop is a stop pawl which is pivotably supported on the objective support, is resiliently biased into its preventive position, and can be pivoted into its liberating position.

14. A microfilm reader as claimed in claim 13, wherein the stop pawl is biased by a spring.

15. A microfilm reader as claimed in any one of claims 1 to 14, wherein the rotary prism is retained on the objective tube by its own weight.

16. A microfilm reader substantially as hereinbefore described with reference to, and as shown in, Figs. 1 and 2 of the accompanying drawings.

17. A microfilm reader substantially as hereinbefore described with reference to, and as shown in, Figs. 1 and 2 of the accompanying drawings modified substantially as hereinbefore described with reference to, and as shown in, Fig. 3 of the accompanying drawings.