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(19)



(54) BELLOWS FOR A PHOTOGRAPHIC CAMERA

(71) We, EASTMAN KODAK COMPANY, a Company organized under the Laws of the State of New Jersey, United States of America of 343 State Street, Rochester, New York 14650, United States of America do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

The invention relates to a folding bellows of substantially square or rectangular cross-section for use on a photographic camera having a lens which is arranged on a carrier attached to the camera housing so that the camera can be folded and unfolded, and which serves to produce a light-proof chute for the taking ray-path between the taking lens and the film plane in the camera housing.

One of the problems with folding bellows is how to accommodate them in the minimum space, in the camera housing, when the camera is folded.

It is an object of the present invention to provide an improved bellows arrangement of the type above mentioned which is of simple construction and economical to manufacture. The arrangement is furthermore to take the form of a separate unit which can easily be built into a camera.

According to the present invention, there is provided a folding bellows of substantially square or rectangular cross-section for use on a folding photographic camera having a taking lens which is arranged on a carrier attached to the camera housing so that it can be unfolded and which bellows serve to produce a light-proof chute for light rays between the taking lens and a film plane in the camera housing, wherein the first wall of the bellows locatable along the lens carrier is non-folding and only the other three walls can be folded, and also in that both the ends of the bellows are attachable, to a lens

carrier and a camera housing respectively, by clamp connections.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a diagrammatic section of a bellows arrangement according to the invention, built into a camera shown erected;

Figure 2 is a fragmentary, sectional view, to an enlarged scale, of part of an end of the bellows arrangement according to Figure 1, to which end is attached a lens;

Figure 3 is a view, similar to Figure 2 of the bellows when the bellows are folded up.

Figures 4 and 5 are diagrammatic representations of individual elements of the bellows arrangement according to Figure 1;

Figure 6 illustrates the bellows, as a separate unit, folded up, viewed in the direction of the arrow "B" in Figure 3; and

Figure 7 is a sectional view, in the direction of the arrow "C" in Figure 2, of the bellows as a separate unit, but erected.

Figure 1 illustrates generally in the erected condition, a bellows arrangement according to the invention. The bellows is opened to the illustrated condition by movement of a lens carrier 18 in the direction of the arrow A. The bellows 11 take the form of a light-proof chute of flexible, pliant material, approximately rectangular or square when viewed in section transverse to the chute. Three adjacent walls of the bellows 11 can be folded, while the fourth wall 12 is held between an inner plate 13 and an outer plate 14.

The plates 13 and 14 extend to the region of a taking lens 16 and have parallel bent-off portions 13a and 14a. The design of the plates 13 and 14 can be better seen from Figures 4 and 5 and will be described later on.

The lens carrier 18 is arranged parallel to the plates 13 and 14, and forms an intermediate space 17. The taking lens 16 is

attached to the forward end of the carrier, which is parallel to the bent-off portions 12a and 14a. A spacing element 19 with an opening 20 for the passage of light rays is provided in the space 17 between the carrier 18 and the bent-off portion 14a of the plate 14 (see Figures 2 and 3).

The lens end of the bellows 11 has a cylindrical neck 21 ending in a rim 22 facing forwardly. With this rim 22 the bellows 11 engage the bent-off portion 14a of the plate 14 so that the lens end of the bellows is held against the outer plate 14 in light-proof connection therewith. The rim 22 is embedded in an annular groove 23 formed in the spacing element 19. A light-proof connection is thus established by simple means between the lens end of the bellows 11 and the taking lens 16. The lens end of the bellows is fastened to the lens carrier 18 by screws 24 and 25. The screw 24 joins the outer plate 14 to the lens carrier 18 and the screw 25 joins the inner plate 13, the bellows 11 and the outer plate 14 to the lens carrier 18.

The space 17 formed between the bellows arrangement and the lens carrier 18 serves to house some movable camera control elements 26. In this way the functioning of these elements cannot be hampered by the folded wall portions of the bellows 11.

The join between the inner plate 13 and the outer plate 14, and also the bellows wall 12 which is located between the two plates, is effected by means of a lug 27 provided on the outer plate 14. This lug 27 projects through a hole 28 in the wall 12 and a coincident hole 29 in the inner plate 13 and is bent over to engage the plate 13.

In order to prevent light from being reflected on the lug 27, a raised portion 30 is provided on the inner plate 13, in front of the lug 27, the lug being located in the "shade" of this raised portion.

The manner in which the camera end of the bellows 11 is designed and secured in position can be seen from Figure 1. The camera end of the bellows terminates in a rim 31 which faces inwardly and is clamped between a bellows frame 32 and the camera housing 33, the bellows frame 32 being drawn against the camera housing 33 by means of a frame 34 and screws 35. For this purpose the bellows frame 32 is provided with a surrounding recess 36 approximately corresponding to the cross-sectional shape of the rim 31. This rim 31 further includes webs 37 extending approximately in the direction of the optical axis which ensure secure engagement in a groove 38 of appropriate design, in the bellows frame 32. The webs 37 and the groove 38 may extend either all or part of the way round the camera housing 33. The rim 31 is thus prevented from becoming disengaged if the

bellows 11 are subjected to stress - which may occur for instance if the camera is not handled properly. Nevertheless, to allow the rim 31 a certain degree of flexibility in the area in which it is secured, the wall portion 39 of the camera housing 33, which also supports the rim, is spaced away from same rim 31. The resultant gap is bridged by a further narrow web 40 which is provided on the rim 31 and rests against the wall portion 39. In this simple way the camera end of the bellows 11 is also attached to the camera housing 33 in a secure and light-proof manner.

Figures 4 and 5 are detailed views of the inner plate 13 and the outer plate 14 respectively. The elevation 30 on the plate 13 can clearly be seen: similarly the bent lug 27 of the outer plate 14 arranged to extend through the hole 29 so as to be located in the shade of said elevation when the plates and the bellows 11 have been assembled. Openings 41 and 42 for the passage of light rays are furthermore formed in the bent-off portions 13a and 14a, respectively, of the plates 13 and 14.

In order to make the stack of folds as low as possible when the bellows 11 are folded up, thereby minimising the distance between the bellows frame 32 and the lens carrier 18, the outer plate 14 is provided, in the area of the most folds, with recesses 43 into which the portions of the bellows 11 disposed in this area are pressed by lateral projections 44 on the inner plate 13, opposite said recesses 43. To this end the projections 44 formed on the sides of the inner plate 13 are bent towards the outer plate 14 to make room for the folds of the bellows 11 which, in these regions, are thickest.

The lateral projections 44 simultaneously serve to centre the bellows 11 within the bellows arrangement as can be seen from Figure 7. For the same purpose, moreover, the outer form of the bent-off portion 13a of the plate 13 is adapted to the inner contour of the bellows 11.

The inner plate 13 may be coated on the inside with a non-reflecting material such as matt varnish to reduce reflection. Alternatively or additionally it may be provided with embossments transverse of the taking raypath which divert reflection rays.

WHAT WE CLAIM IS:-

1. A folding bellows of substantially square or rectangular cross-section for use on a folding photographic camera having a taking lens which is arranged on a carrier attached to the camera housing so that it can be unfolded and which bellows serve to produce a light-proof chute for the light rays between the taking lens and a film plane in the camera housing wherein the first wall of the bellows locatable along the lens carrier



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non-folding and only the other three walls can be folded, and also in that both the ends of the bellows are attachable, to a lens carrier and a camera housing respectively, by clamp connections.

2. A bellows as claimed in Claim 1, incorporated in a photographic camera and wherein the non-folding wall of the bellows is held between two planar plates with extensions bent off into the region of the lens, and in that the forward end of the bellows protrudes through an opening in an outer of the two plates and has a cylindrical neck, the neck terminating in a circular rim facing forwardly and by means of which, the bellows are clamped against the outer plate, and wherein the camera end of the bellows has a surrounding rim which faces inwardly and defines a bellows opening, the rim being secured to the camera housing by means of a bellows frame and clamp connections.

3. A bellows as claimed in Claim 2, wherein the bellows, the plates and the bellows frame form a separate unit.

4. A bellows as claimed in Claim 3, wherein a space is formed between the lens carrier and the outer plate, the space being maintained in the region of the lens-end rim by a spacing element which has a circular groove adapted to the cross-sectional form of the rim, the rim being clamped in the groove when the outer plate is connected to the lens carrier.

5. A bellows as claimed in Claim 2, 3 or 4, wherein a camera-end rim of the bellows is provided with a web which extends all or part of the way round the rim and extends in the direction of the optical axis, the web engaging a groove in the bellows frame without any play.

6. A bellows as claimed in Claim 2, 3, 4 or 5, wherein the bellows frame is fastened to the camera housing by means of screws and a frame, the camera-end rim being clamped therebetween.

7. A bellows as claimed in Claim 5 or 6, wherein the camera-end rim has an outwards-facing surrounding web which rests against a wall portion of the camera housing.

8. A bellows as claimed in any of Claims 2 to 7, wherein the outer plate has at least one lug which passes through holes in the wall of the bellows and in the inner plate, being bent over and to join the plates.

9. A bellows as claimed in Claim 8, wherein the bent lug(s) is/are located in the shade of one or more raised portions, disposed in an inner of the two plates, between the lens and the lug(s).

10. A bellows as claimed in any of Claims 2 to 9, wherein the inner plate is provided with lateral projections for centering the bellows.

11. A bellows as claimed in Claim 10,

wherein the regions of the projections on the inner plate, the outer plate is provided with recesses into which the lateral projections extend, together with wall portions of the bellows which, in the folded state locate in these regions.

12. A bellows as claimed in Claim 10 or 11, wherein the lateral projections are located in the region of the thickest folds of the bellows.

13. A bellows substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

14. A folding photographic camera incorporating a bellows as claimed in any preceding Claim.

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