

PATENT SPECIFICATION

(11) 1 534 211

1 534 211

- (21) Application No. 25244/77 (22) Filed 16 June 1977
 (31) Convention Application No. 2632944
 (32) Filed 22 July 1976 in
 (33) Federal Republic of Germany (DE)
 (44) Complete Specification published 29 Nov. 1978
 (51) INT CL² G03B 9/08
 (52) Index at acceptance
 G2A 401 403 NK



(54) IMPROVEMENTS IN OR RELATING TO CAMERA SHUTTERS

(71) We, FRANKE & HEIDECHE
 GMBH, a German Body Corporate,
 trading as ROLLEI-WERKE
 5 FRANKE & HEIDECHE, of 196
 Salzdahlumer Strasse, Braunschweig,
 Germany, do hereby declare the invention,
 for which we pray that a patent may be
 granted to us, and the method by which it is
 10 to be performed, to be particularly
 described in and by the following
 statement:—

The present invention refers to a focal
 plane shutter for a photographic camera
 with a brake system for braking the
 15 movement of the shutter, the brake system
 becoming effective towards the end of the
 shutter movement.

Focal plane shutters in which very fine,
 thin metal blades are combined in a
 20 multilap arrangement to form a shutter,
 curtain require nevertheless remarkable
 motive spring forces in spite of
 considerably reduced mass weights of their
 movable parts. These relatively high spring
 25 forces have to be effective over the picture
 window during the entire swivelling
 distance of the partial shutters in order to
 form exact slot speeds. This means that the
 amount of energy to be applied for the
 30 swivelling process at the running-down of
 the shutter has to be braked abruptly and to
 full extent at its end.

Brake systems which allow for such an
 often quite abrupt braking are well-known.
 35 So, among others, it is already known (Dt-Ps
 10 90 508) to brake the running down
 shutter curtain of a focal plane shutter by
 means of a winding belt brake similar to
 drum brakes. This belt brake acts with
 40 defined brake torque onto a brake drum
 which is connected with actuating effect for
 its part with a shutter curtain via a coupling
 mechanism consisting of a coil spring and
 an engaging drum, and forked lever. The
 45 coupling mechanism only effective in one
 direction, known as coil coupling, serves to
 transmit the brake torques of the drum
 brake onto the shutter curtain during the
 braking process and to uncouple again the

proper brake spring of this drum brake in
 order to prevent unreasonable high cocking
 forces when cocking the shutter. 50

Such a brake gear realizable only with
 considerable additional components for a
 coupling equipment, has moreover, the 55
 disadvantage that a coupling coil of the
 known type is generally operating with
 differing low slip. Furthermore external
 influences can change this slip. Moreover,
 such brake systems have a relatively high
 60 space requirement.

The present invention preferably
 provides a brake system not susceptible to
 much trouble for a focal plane shutter of the
 above mentioned type which brakes the 65
 shutter in a gentle way to a defined end
 position without causing any bumpings and
 vibrations, which allows an arrangement of
 low volume and the brake torque of which,
 and by this the shutter end position, (blade 70
 overstroke) can be adjusted in a simple and
 exact manner.

According to the present invention there
 is provided a focal-plane shutter for a
 photographic camera with a brake system 75
 to brake the movement of the shutter, the
 brake system becoming effective towards
 the end of the shutter movement, wherein
 the braking system comprises at least one
 first brake element with substantially 80
 constant braking torque over the braking
 distance and at least one second brake
 element with an increasing braking torque
 over the braking distance, and the braking 85
 torques of the brake elements adding up
 when the shutter movement is braked and
 being adjustable independently of each
 other.

The separation of the total brake torque
 into one constant partial brake torque and
 one progressively increasing second partial
 brake torque to be combined, has the
 advantage that the starting point for the
 braking of the shutter elements is not only 90
 designed sufficiently soft and shows a quick
 steep increase but can also be arranged
 relatively early, still in the last swivelling
 range within the picture window without 95

having any influence on the slot speed. In this way it is possible to fix the end point of the braking with a small overstroke beyond the end position without any stop at all and to avoid all bumping and vibration processes whatsoever at the extremely thin and delicate metal lamellae of the shutter blades.

By the compact design of its brake system, the invented shutter allows an advantageous installation on smallest space next to the narrow side of the camera film stage. To this contributes very considerably the space-saving arrangement of the brake units divided into two individual brake elements each. The equipment of the brake system by means of preferred examples can be gathered from the subclaims and are explained in detail in the example description and clearly shown by means of drawings.

Constructional embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawing, wherein:—

Figure 1 is a side view of the brake system with brake shoes arranged side by side, partly drawn in sections at slowed-down position (variation I);

Figure 2 is a top view of the brake system as per Figure 1;

Figure 3 is a section as per Figure 2, drawn in position with cocked shutter (slowed-down);

Figure 4 is a side view of the brake system with brake elements combined to one brake unit, in brake position (variation II);

Figure 5 is a top view as per Figure 3;

Figure 6 is a side view of the brake system with brake elements actuating in longitudinal direction (variation III); and

Figure 7 is a top view as per Figure 6.

In Figure 1 there is represented in a lateral elevation an assembly of the brake system with two three-dimensionally separated brake blocks 1, 2 arranged one beside the other on plate 3. The respective associated individual parts of the brake blocks are fitted on two bearing pins 4, 4' inserted into the plate. For each brake block (the corresponding reference numerals of the identical second brake block are also stated), these are a washer 5, 5', a brake lever 6, 6', a slide washer 7, 7' inserted with a bent-over leg into an aperture in the plate and thus secured against rotation; then there follow a number of dished springs 8, 8' serving as brake elements, which are kept pressed under spring stress against the brake levers 6, 6' by a clamping ring 9, 9' by means of a clamping screw 10, 10' which can be screwed axially into the bearing pin 4, 4'. Finally in each case a helical spring 11, 11' is held as further brake element on the

brake blocks 1, 2 with the peripheral surface of the clamping ring 9, 9' as a kind of seating centring. To left and right of each brake block 1, 2 there is arranged a shutter drive system 28, 28' which drives the shutter members. The two shutter members are arranged so that one, the leading shutter member, opens the shutter while the other, the trailing shutter members, closes the shutter. Between the two brake blocks the return device of the brake levers 6, 6' and the adjusting device for the helical spring 11, 11' are likewise situated on the plate 3.

The return device of the brake levers 6, 6' consists of a setting lever 16 which is rotatably mounted at the pivot point 15. Two pins 17, 17' fitted on the setting lever 16 cooperate each with an arm 18, 18' of the brake levers 6, 6'. A protruding arm 19 of the setting lever 16, pointing approximately perpendicularly of the pins 17, 17', engages in a slot 20 on a return slider 21. This return slider 21 again is set in a longitudinal movement indicated by the arrow, simultaneously with the shutter cocking (not shown). Above the return device, in a cover plate 22 covering the shutter assembly (Figure 1), there is an adjusting device for the adjustment of the brake elements consisting of the helical springs 11, 11' (indicated in dot-and-dash lines in Figure 2 in distinction from the return device situated therebeneath). A setting bar 23, the downwardly bent legs 24, 24' of which extend through corresponding slots in the cover plate 22, is rotatably mounted in a similar bearing in the cover plate 22 which is identically aligned with the pivot point 15. An adjusting lever 25 with its slot 26 can be shifted radially by a small amount and arrested by means of a clamping screw 27 screwed into the cover plate. Now the free spring ends 14, 14' of the helical springs 11, 11' bear against the bent-over legs 24, 24' passing through the cover plate. The opposite spring ends of the helical springs 11, 11' are supported on upwardly bent legs 12, 12' of the brake levers 6, 6' under a predetermined spring stress.

The brake system 1—27, which is self-contained in assembly and function, now cooperates merely through the free legs 12, 12' of the brake levers 6, 6' with the shutter drives 28, 28' of the two shutter members. This operative connection is produced by a brake link 29, 29' which is firmly connected to the shutter drives 28, 28' respectively. The brake links and also the other movable components (not shown) of the drives are mounted rotatably in drive bearings 30, 30'. Lever arms 31, 31' which are directed to the exterior of the brake system and of different shapes for the purpose of adaptation to the shutter cocking members

and the actuation of the shutter blades (not illustrated for the sake of clarity) are connected at the bearing point 32, 32' with the shutter members. The brake links 29, 29' in turn act, each with a nose 34, 34' protruding into the brake system and contacting the brake levers 6, 6' at the points 33, 33', upon the brake levers 6, 6' of the brake system.

The manner of operation of the brake system will be discussed below. According to a functional assembly of the brake system as illustrated in Figures 1 and 2 and clearly recognisable from illustration especially in Figure 2, the shutter members after release of the shutter has taken place stand in their braked end position. A position assumed before the release, especially such a position of the brake links 29, 29' and the brake levers 6, 6', is shown by Figure 3 for a shutter member, on the left in Figure 1, with the shutter drive 28.

In the cocking of the shutter with the film-winding lever externally of the camera the lever arm 31, 31' is pivoted in the clockwise direction and the shutter drive 28, 28' is cocked. Together with the cocking movement of the lever arm 31, 31' the return slider 21 for the brake blocks 1, 2 is also shifted to the left (Figure 2). Thus the setting lever 16 pivots in the clockwise direction about the bearing point 15. By means of the free legs 18, 18' bearing on the pins 17, 17' the brake levers 6, 6' are pivoted out of the position as shown in Figure 1 into the initial position of brake readiness, visible in Figure 3, in the counter-clockwise direction about the bearing pin 4, 4'. The nose 34, 34' of the brake link 28, 28' is shifted, at the contact point 33, 33', far away from, the bent-up leg 12, 12' of the brake lever, which leg likewise is shifted somewhat thereafter.

With a renewed shutter release the manner of operation of the actual brake elements 8, 8', 11, 11' is to be discussed in greater detail. The total brake moment necessary for the braking of the shutter parts of the shutter members, moved with relatively high energy, to an end position to be occupied after the running off of the shutter by a brake action commencing only directly before this end position is reached, is divided into two individual moments with the brake elements 8, 8', 11, 11'. Here the first brake moment with the dished springs 8, 8' between the washer 5, 5', the slide washer 7, 7' and the clamping ring 9, 9' effects a constant brake moment (M_F) based upon friction.

The dished springs 8, 8' alone would be sufficient for the brake action only if sufficient construction volume were available in the camera for the necessary larger formation. Thus however a further

brake moment is necessary. This must furthermore be accommodated primarily in space-saving manner. The solution was found with the helical spring 11, 11'. By reason of its natural core hole the helix turns could be arranged on the periphery of the clamping ring 9, 9'. The spring ends engage with a basic initial stress firstly on the downwardly bent legs 24, 24' of the setting bar 23 and also on nearly the outermost point of the brake lever 6, 6' of the upwardly bent leg 12, 12'.

As regards the brake action the helical spring generates a rising spring force and thus a likewise rising brake moment (M_M) between its support points on rotation of the brake lever 6, 6' to the right. This is now added to the constant brake moment of the dished springs 8, 8' as $M_F + M_M = M_T$, characterised by a rising brake characteristic. The two brake moments can now be adjusted separately. With the clamping screw 10, 10' and the clamping ring 9, 9' the constant moment of the dished springs is varied. Lateral pivoting of the setting bar 23 after release of the blocking screw 35 varies the initial stress of the helical spring 11, 11'. Both kinds of spring in common raise or lower the starting point of the brake characteristic, the helical spring 11, 11' additionally varies its steepness.

A further very advantageous effect is brought by the formation and operative arrangement of the helical spring 11, 11'.—While in the return of the shutter and of the brake system from the brake position, in which with the film winding lever in any case spring forces of the shutter drive 28, 28' alone, already rising to considerable values, must be produced, the brake moment (M_F) of the dished springs in fact remains constant, on the other hand, the expanding helical spring 11, 11' effects an increasingly falling spring moment, so that the total friction moment is relieved ($M_T = M_F - M_M$). The consequence is a clearly noticeable relieving of the cocking force on the film-winding lever during the last cocking phase.

In Figure 4 a variant is illustrated of the brake system assembled as described with approximately the same components, which is to be explained below:—

In order to save still further space, in comparison with the first form of construction (Figures 1 and 2) the two brake blocks 1, 2 arranged side by side are replaced by one single brake unit 101 acting upon the two shutter members. All components exerting approximately equal functions are hereinafter provided with similar reference numerals as from 101.

On a single bearing pin 104 in this variant, inserted into the plate 103, all the parts movable about this pin with their

70

75

80

85

90

95

100

105

110

115

120

125

130

clamping and adjusting devices and the brake elements 108, 111, 111' are arranged. Thus lowermost on the plate 103 there is a washer 105 consisting of slidable material. This is followed in series by a forked brake lever 106 pointing towards the left shutter member, a further slide washer 107, a forked lever 106' directed to the right shutter member and a further slide washer 107'. The slide washer 107' is made fast with a downwardly bent leg let into the plate 103, as protection 113 against rotation (Figure 5). These parts are pressed by a helical compression spring 108 bearing on a clamping plate 109, with a constant spring force which generates a friction moment (M_F) between the slide washers 107, 107', the forked brake levers 106, 106' and the plate 103. The clamping plate 109 acting by means of a clamping screw 110 upon the helical compression spring serves at the same time for the adjustment of the spring force in the axial direction to the bearing pin 104. As well as this helical compression spring generating the required constant friction moment (M_F), there are provided two brake elements causing the variable brake moment (M_M), likewise guided by the bearing pin 104. With the purpose of the saving space these brake elements are formed as two helical torsion springs 111, 111' wound in one another. An eye 114, 114' protruding at the lower end of each of the springs is placed around an engaging pin 117, 117' secured on the forked brake levers 106, 106'. The opposite spring ends 115, 115' are bent upwards and pushed under the action of a certain radial spring initial stress into two adjusting notches 123, 123' formed out beneath the clamping plate 109. The adjustment is effected by rotation of the clamping plate in or contrarily of the clockwise direction. During the adjustment of the helical compression spring 108 in the axial direction, the radial adjusting movement of the clamping plate must be terminated and this plate must be held fast in this position until the clamping screw 110 is tightened in the ideal position.

The manner of operation of this brake unit 101 is as follows:—

The operative connection of the brake unit with the two shutter members is effected by the forked brake levers 106, 106' into the forked legs 112, 112', 118, 118' of which the brake links 129, 129' of the shutter drives 128, 128' extend (Figure 5). The forked brake levers 106, 106', mounted one above the other at different levels on the bearing pin 104, must be brought by cranking to a uniform level in relation to the brake links (clearly visible in Figure 4). Thus the short fork leg 112 of the brake lever 106 mounted lowermost is already

made in alignment with the brake link 129. The long fork leg 118 on the other hand is cranked upwards and rests against a return pin 116 of the brake link 129. On the right side of Figure 4 the short fork leg 112' of the forked brake lever 106' mounted higher by the amount of the slide washer 107 is bent downwards so that the brake link 129' can cooperate with the short fork leg 112'. The long fork leg 118' on the other hand is cranked a little upwards so that it rests on the return pin 116'.

In the plan view in Figure 5 now the manner of operation of the brake system in this variant can be seen. Starting from the problem of braking the proceeding shutter drive spring forces smoothly and without jolts shortly before their end positions are reached, the brake forces are transmitted from the forked brake levers for braking to the brake links. In departure from the manner of operation of the first variant, which in principle is the same, as well as the compact assembly of the spring elements a further difference exists in the function of the brake links merely in that these not only take over the braking of the shutter member but at the same time in shutter cocking the return on the brake elements into the initial position of brake readiness. This takes place as follows:— If one considers the solid lines (Figure 5 right side) of the fork legs 112', 118' and brake link 129', on shutter cocking, that is on return of the brake elements, they stand in a position in which the brake link 129' with return pin 116' has reached the long fork leg 118' and moves the latter on further movement of the cocking lever of the camera into the position B indicated in chain lines. This is the initial position for the braking readiness of the brake unit.

On release of the shutter and with the running off of the shutter drive now the brake link 129, 129' pivots about the drive bearing 130, 130' in the clockwise direction. In this movement the nose 134, 134', shortly before the illustrated position, at the contact point 133, 133' strikes upon short fork leg 112, 112' and pivots with rising brake moment ($M_T = M_F + M_M$) into the braked end position C.

With more compact assembly due to spatial placing together of the brake elements and levers on one pivot point 104, and the combining of the adjusting means to one clamping plate 109, in fact construction space has been gained, on the other hand the first variant, with somewhat more expense for individual parts, permits and exact adjustment for each individual brake element.

Finally in Figures 6 and 7 a third variant is shown according to the same functional principle of additive brake forces in a

70

75

80

85

90

95

100

105

110

115

120

125

130

longitudinal direction of action. For the sake of simplicity only those parts are illustrated which serve for the understanding of the bringing about of the brake forces. All other parts and manners of operation correspond to those of the described variants I and II and are omitted. Reference numerals nearly identical in assembly and manner of operation begin with 201.

Only one side of a brake unit, which *per se* is in two parts, illustrated in Figure 6 in lateral elevation and in Figure 7 in plan view. The carrier of the components is a plate 203. The elongated brake lever 206 is longitudinally displaceably mounted in a slot 205 beneath the plate by means of the bearing pin 204. In order to achieve the longitudinal mobility with a defined brake force (F_T), between the brake lever 206 and plate 203 a slide washer 207 is situated and a further slide washer 207' situated between the plate and a draw plate 212. The draw plate 212 is at the same time the bearing surface of the helical compression spring 208. The counter bearing of the helical compression spring is again formed by a clamping plate 209 which is adjustable in the axial direction in relation to the bearing pin and securable with the clamping screw 210. With these components the constant brake force (F_T) is fixed. The brake lever which is longitudinally movable in the direction of the arrow (Figure 5) is loaded with a further return force (F_p) of an initially tensioned tension spring 211 acting on the draw plate 212. The one spring end of the tension spring is hooked in a bore 213 of the draw plate 212, the opposite spring end 215 is hooked on and adjusting threaded pin 224. The brake force (F_T) necessary for the braking of the shutter member is thus exactly determinable by means of separately adjustable individual moments. $F_T = F_F + F_p$ results from the two brake elements 208, 211. Here again the brake force (F_T) in the return of the brake lever by the shutter cocking, shortly before its initial position is reached, reduces by $F_T = F_F - F_p$ in favour of an easier expenditure of force during the remaining pivot path of the camera cocking lever.

The connection of the two brake units of this variant (only one illustrated) cooperates through a brake link 229 (Figure 7), which is pivotable (arrow A) about the drive bearing 230 of the shutter drive 228, in a simple manner with the brake lever 206:— Between two pins 216, 217 inserted in the brake lever 206 the brake link can move in freely pivoting manner during the running off of the shutter. In Figure 5 the contact point 223 between brake link and return pin 216 is illustrated. The end position of the brake lever is situated in a position (not

shown) corresponding to B in Figure 5. Analogously the brake end position of the brake lever 206 is in the position C in Figure 5, that is to say with a remaining path going beyond illustrated point of the engaging pin 217 in Figure 6, direction C.

In conformity in all three variants, no fixed stop is provided for the running-off shutter members in the braked end position, so that the "click" typical of photography in shutter release becomes nearly inaudible. The braking of the partial shutters here begins on the last millimetres in the picture aperture 36 of the picture frame, and comes to a halt without impact in the braked end position directly behind the aperture end of the picture aperture. In this position the shutter blades, consisting of very thin metal plates, and their suspensions on the lever arms 31, 31' carry out material-caused dying-down movements acting as an over-stroke, which permit the shutter to come to rest smoothly.

WHAT WE CLAIM IS:—

1. A focal-plane shutter for a photographic camera with a brake system to brake the movement of the shutter, the brake system becoming effective towards the end of the shutter movement, wherein the braking system comprises at least one first brake element with a substantially constant braking torque over the braking distance and at least one second brake element with an increasing braking torque over the braking distance, and the braking torques of the brake elements adding up when the shutter movement is braked and being adjustable independently of each other. 90
2. A shutter as claimed in Claim 1, wherein a first and a second brake element are combined on a brake-block. 95
3. A shutter as claimed in Claim 2 with a leading shutter member to open the shutter and a trailing shutter member for closing the shutter, wherein one brake block is associated with the leading shutter member while another such brake block is associated with the trailing shutter member. 100
4. A shutter as claimed in Claim 3, wherein the two brake blocks are arranged separately in terms of space. 105
5. A shutter as claimed in Claim 3, wherein the two brake blocks are combined to one brake unit. 120
6. A shutter as claimed in Claim 4, wherein the first brake element consists of at least one cup spring held on contact pressure. 125
7. A shutter as claimed in Claim 5, wherein the two first brake elements of the brake blocks are formed by one helical spring only.
8. A shutter as claimed in any one of the

longitudinal direction of action. For the sake of simplicity only those parts are illustrated which serve for the understanding of the bringing about of the brake forces. All other parts and manners of operation correspond to those of the described variants I and II and are omitted. Reference numerals nearly identical in assembly and manner of operation begin with 201.

Only one side of a brake unit, which *per se* is in two parts, illustrated in Figure 6 in lateral elevation and in Figure 7 in plan view. The carrier of the components is a plate 203. The elongated brake lever 206 is longitudinally displaceably mounted in a slot 205 beneath the plate by means of the bearing pin 204. In order to achieve the longitudinal mobility with a defined brake force (F_T), between the brake lever 206 and plate 203 a slide washer 207 is situated and a further slide washer 207' situated between the plate and a draw plate 212. The draw plate 212 is at the same time the bearing surface of the helical compression spring 208. The counter bearing of the helical compression spring is again formed by a clamping plate 209 which is adjustable in the axial direction in relation to the bearing pin and securable with the clamping screw 210. With these components the constant brake force (F_T) is fixed. The brake lever which is longitudinally movable in the direction of the arrow (Figure 5) is loaded with a further return force (F_p) of an initially tensioned tension spring 211 acting on the draw plate 212. The one spring end of the tension spring is hooked in a bore 213 of the draw plate 212, the opposite spring end 215 is hooked on and adjusting threaded pin 224. The brake force (F_T) necessary for the braking of the shutter member is thus exactly determinable by means of separately adjustable individual moments. $F_T = F_p + F_p$ results from the two brake elements 208, 211. Here again the brake force (F_T) in the return of the brake lever by the shutter cocking, shortly before its initial position is reached, reduces by $F_T = F_T - F_p$ in favour of an easier expenditure of force during the remaining pivot path of the camera cocking lever.

The connection of the two brake units of this variant (only one illustrated) cooperates through a brake link 229 (Figure 7), which is pivotable (arrow A) about the drive bearing 230 of the shutter drive 228, in a simple manner with the brake lever 206:— Between two pins 216, 217 inserted in the brake lever 206 the brake link can move in freely pivoting manner during the running off of the shutter. In Figure 5 the contact point 223 between brake link and return pin 216 is illustrated. The end position of the brake lever is situated in a position (not

shown) corresponding to B in Figure 5. Analogously the brake end position of the brake lever 206 is in the position C in Figure 5, that is to say with a remaining path going beyond illustrated point of the engaging pin 217 in Figure 6, direction C.

In conformity in all three variants, no fixed stop is provided for the running-off shutter members in the braked end position, so that the "click" typical of photography in shutter release becomes nearly inaudible. The braking of the partial shutters here begins on the last millimetres in the picture aperture 36 of the picture frame, and comes to a halt without impact in the braked end position directly behind the aperture end of the picture aperture. In this position the shutter blades, consisting of very thin metal plates, and their suspensions on the lever arms 31, 31' carry out material-caused dying-down movements acting as an over-stroke, which permit the shutter to come to rest smoothly.

WHAT WE CLAIM IS:—

1. A focal-plane shutter for a photographic camera with a brake system to brake the movement of the shutter, the brake system becoming effective towards the end of the shutter movement, wherein the braking system comprises at least one first brake element with a substantially constant braking torque over the braking distance and at least one second brake element with an increasing braking torque over the braking distance, and the braking torques of the brake elements adding up when the shutter movement is braked and being adjustable independently of each other.
2. A shutter as claimed in Claim 1, wherein a first and a second brake element are combined on a brake-block.
3. A shutter as claimed in Claim 2 with a leading shutter member to open the shutter and a trailing shutter member for closing the shutter, wherein one brake block is associated with the leading shutter member while another such brake block is associated with the trailing shutter member.
4. A shutter as claimed in Claim 3, wherein the two brake blocks are arranged separately in terms of space.
5. A shutter as claimed in Claim 3, wherein the two brake blocks are combined to one brake unit.
6. A shutter as claimed in Claim 4, wherein the first brake element consists of at least one cup spring held on contact pressure.
7. A shutter as claimed in Claim 5, wherein the two first brake elements of the brake blocks are formed by one helical spring only.
8. A shutter as claimed in any one of the



(5)

preceding claims, wherein the second brake element is formed by a helical spring turnable against its sense of winding.

5 9. A shutter as claimed in Claims 5 or 7 and 8, wherein both helical springs are wound into one another.

10 10. A shutter as claimed in any one of Claims 3 to 9, wherein for the transmission of the braking force between the brake block and shutter member one brake lever is provided for each shutter member.

15 11. A shutter as claimed in claim 10, wherein the brake block and brake lever commonly are arranged in the rivet spigots fastened in the shutter sheet bar.

20 12. A shutter as claimed in Claim 11, wherein the brake levers on the rivet spigots are embedded rotatable between sliding discs.

25 13. A shutter as claimed in Claim 10 or 11, wherein the first brake elements are arranged between brake lever and holding device axially shiftable at the rivet spigots end by which device the braking force of the first brake elements are adjustable.

30 14. A shutter as claimed in any one of the preceding claims, wherein the second brake elements constructed as helical springs are engaging with one end at the brake levers and with the other end butt against an adjusting device which is lockable and radially adjustable.

35 15. A shutter as claimed in Claim 4 and any one of Claims 11 to 14, wherein the brake levers are showing fork-like shaped free prongs.

40 16. A shutter as claimed in Claim 4 and any one of Claims 11 to 14, wherein the brake levers are shaped and constructed straight and show two oppositely arranged free legs.

17. A shutter as claimed in Claim 15, having connected with the shutter members which grip between the fork-shaped, fork-

like arranged free legs of the brake levers and which swing the brake levers at shutter operation from a starting position, in which the brakes are ineffective, into a brake position, in which the brakes become effective, and which swing at shutter cocking from the brake position into the starting position.

18. A shutter as claimed in Claim 16, having brake guiding devices connected with the partial shutters and acting on the brake levers and by a brake reset lever being in engagement with the brake levers, which are arranged in such a way that the brake levers at shutter operation are being reset by the brake guiders from a starting position in which the brakes are ineffective into a brake position, in which the brakes become effective (Figure 2) and at shutter winding are being reset by the brake reset lever from the brake position into the starting position.

19. A shutter as claimed in Claims 2 to 4, wherein the brake block consists of a rivet spigot seated in an oblong hole of the sheet bar, shiftable against the force of a tension spring, which spigot bears a brake lever, connected with a shutter member under interposition of two sliding discs and pressed into the sheet bar by a compression spring sitting on the rivet spigot.

20. A focal-plane shutter, substantially as described herein with reference to and as illustrated by the accompanying drawing.

21. A camera having a shutter as claimed in Claim 1, substantially as hereinbefore described.

For the Applicants,
MATTHEWS, HADDAN & CO.,
Chartered Patent Agents,
33 Elmfield Road,
Bromley, Kent.

