

May 21, 1963

H. HELL

3,090,555

COUNTER FOR CAMERAS AND THE LIKE

Filed Dec. 2, 1959

3 Sheets-Sheet 1

FIG. 1

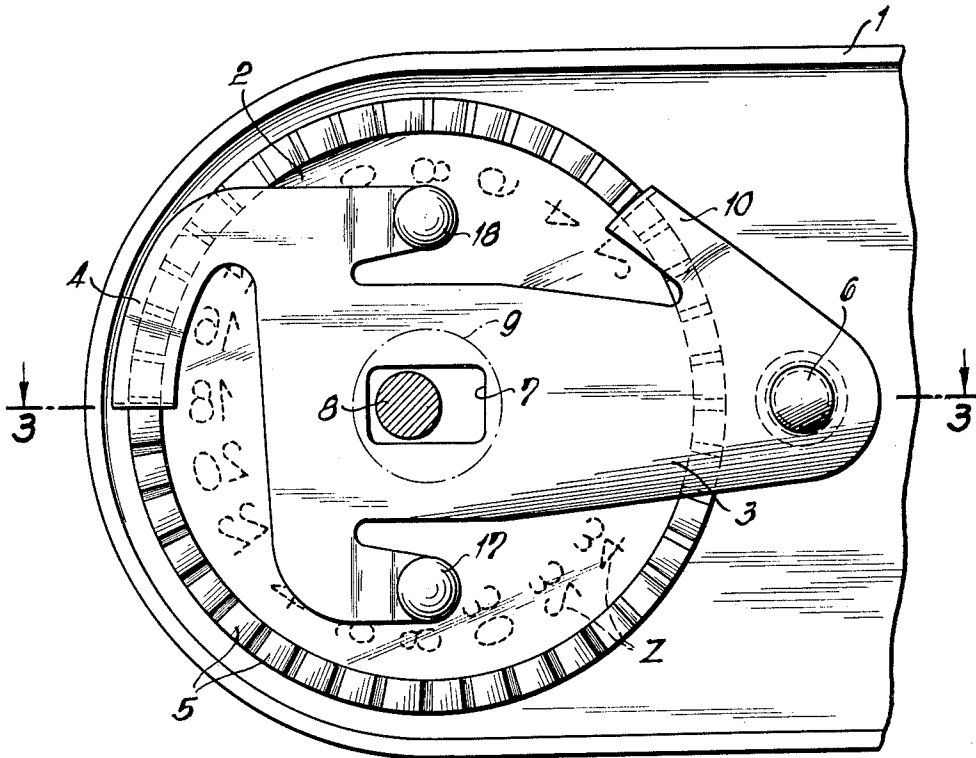
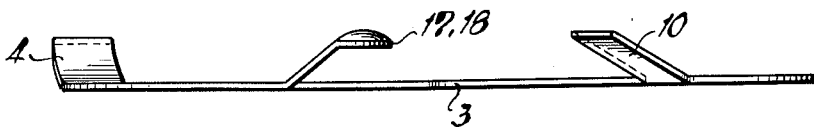


FIG. 2



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3 Sheets-Sheet 2

FIG. 3

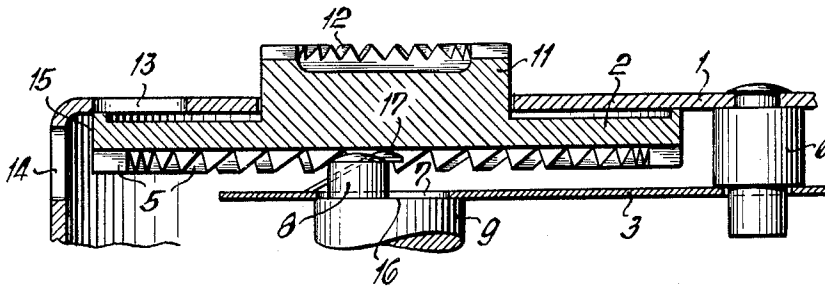
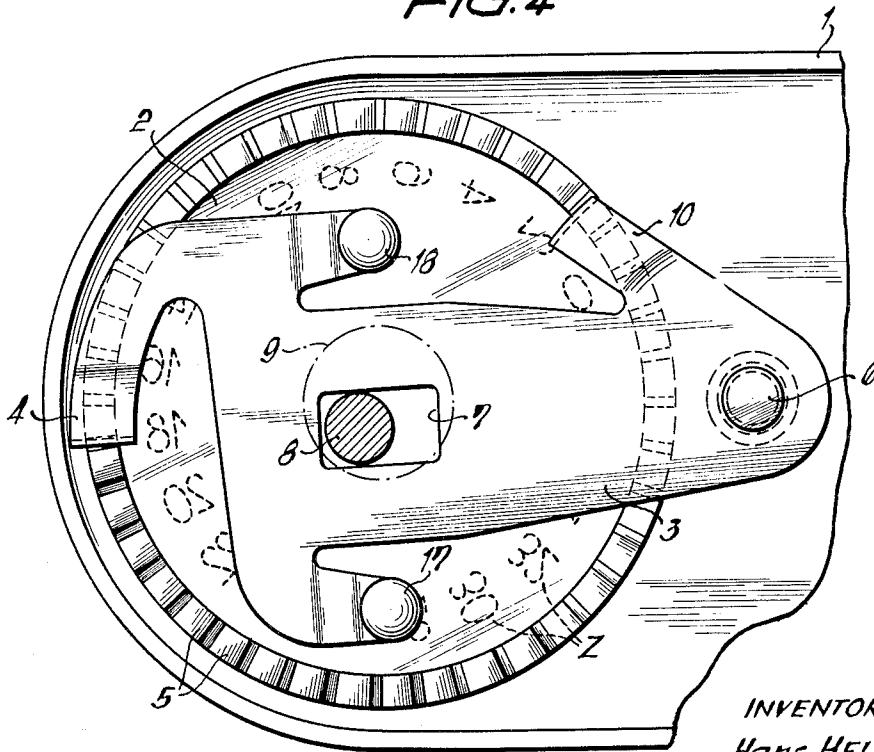


FIG. 4



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3 Sheets-Sheet 3

FIG. 5

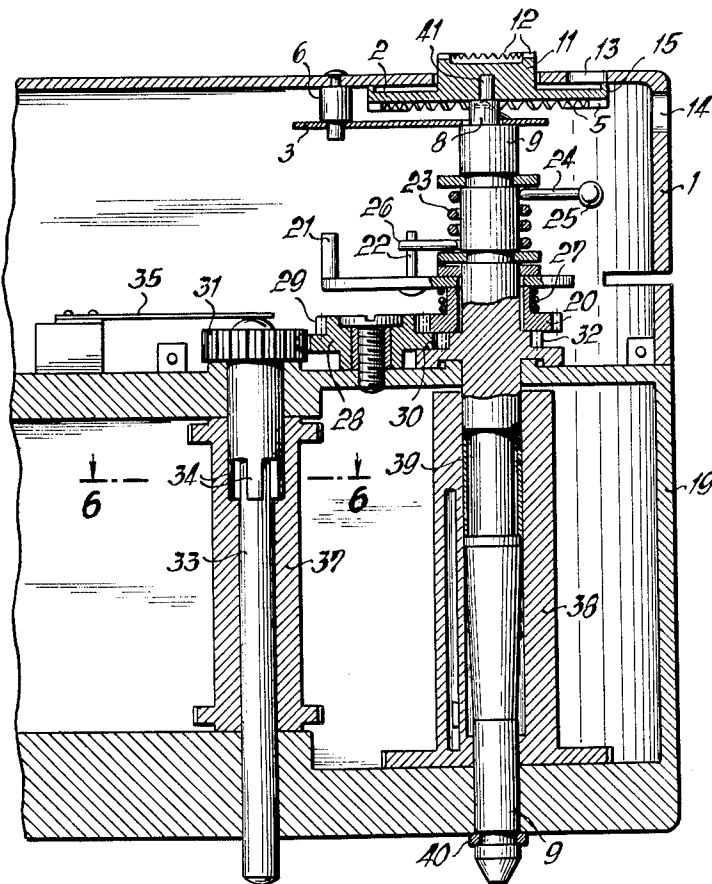
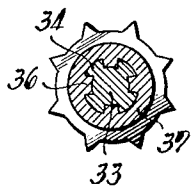


FIG. 6



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1

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8 Claims. (Cl. 235-91)

The present invention relates to counters.

More particularly, the present invention relates to that type of counter which is used for counting the number of times a given mechanism goes through a certain cycle of operations. For example, the counter of the present invention is particularly suited for use in cameras for the purpose of counting the number of film frames which have been exposed.

In the known counters of the above type it is conventional to provide in addition to the counter wheel a pair of pawls one of which serves to advance the counter wheel at each cycle of operations and the other of which serves to prevent return of the wheel after it is advanced, and thus, with this conventional structure a multiplicity of parts are required to cooperate together in a precisely timed relation.

It is a primary object of the invention to provide a structure far simpler than a conventional structure as referred to above while at the same time capable of producing all of the desired results.

A further object of the present invention is to provide a single element which will function to advance the counter wheel and to prevent return thereof.

It is a further object of the invention to provide a single element which will not only advance the counter wheel and prevent return thereof but which will also support the counter wheel.

It is still another object of the present invention to provide a counter assembly wherein none of the parts of the assembly are required to be fixed as by rivets or the like and at the same time all of the parts will be properly supported and will cooperate together, so that with this arrangement not only is the structure exceedingly simple and inexpensive but in addition it can be very easily assembled and disassembled.

With the above objects in view the present invention includes in a counter assembly a rotary counter wheel turnable about a predetermined axis and having a row of teeth arranged along a circle whose center is in this axis. A leaf spring is supported for reciprocatory turning movement about a second axis parallel to the counter wheel axis and this leaf spring has a pair of projections engaging the teeth of the counter wheel, one of these projections of the leaf spring when it reciprocates about the second axis moving substantially circumferentially with respect to the wheel axis while the other of the projections when the spring moves about the second axis moves substantially radially with respect to the wheel axis so that this one projection of the leaf spring acts to advance the wheel while the other projection of the leaf spring acts to prevent turning of the counter wheel in a direction opposite to that in which it has advanced.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a view of an upper portion of a camera as seen from the underside thereof and illustrating the counter assembly of the invention;

2

FIG. 2 is a side elevation of the leaf spring of the invention;

FIG. 3 is a sectional elevation taken along line 3—3 of FIG. 1 in the direction of the arrows;

FIG. 4 shows the structure of FIG. 1 after the leaf spring has been turned through a given increment for the purpose of advancing the counter wheel;

FIG. 5 is a diagrammatic illustration of the camera structure associated with the counter assembly of the invention; and

FIG. 6 is a transverse sectional plan taken along line 6—6 of FIG. 5 in the direction of the arrows.

Referring to the drawings there is shown in FIG. 1 a portion 1 of a device which is provided with the counter structure of the invention. In the illustrated example the structure 1 is the upper portion of a camera housing. As is apparent from FIG. 3 this portion 1 of the device is in the form of a wall which is formed with an opening through which an axial portion 11 of a counter wheel 2 freely passes and the opening through which the portion 11 freely passes closely surrounds the portion 11 so that in this way the wall of element 1 forms a bearing and the element 1 forms a guide means guiding the counter wheel 2 for rotation about its axis. Except for the projection 11 the counter wheel 2 is located next to the underside of the wall of the element 1. As may be seen from FIG. 1 a leaf spring 3 cooperates with the counter wheel 2.

The leaf spring 3 is provided at its left end, as viewed in FIGS. 1 and 2 with a projection 4 which acts as an advancing pawl, this projection 4 engaging the circle of teeth 5 of the counter wheel 2, the circle of teeth being coaxial with the axis of the counter wheel. As was pointed out above, the element 1 serves as a guide means for the counter wheel 2 to guide the latter for rotation, and this element 1 also serves in connection with the pin 6 which is fixed to the wall of the element 1 and extends downwardly from the underside of this wall, as is evident from FIG. 3, as a guide means for the leaf spring 3. This leaf spring 3 is formed adjacent its right end, as viewed in FIGS. 1 and 3, with an opening through which a lower portion of pin 6 of reduced diameter freely extends, and as is apparent from FIGS. 1 and 3 the pin 6 has a downwardly directed shoulder against which the spring 3 bears. It will be noted that the axis of the pin 6 is parallel to the axis of the wheel 2. As may be seen from a comparison of FIGS. 1 and 4, during turning of the leaf spring 3 about the axis of the pin 6 the springy tooth or projection 4 which extends substantially circumferentially with respect to the axis of pin 6 acts as an advancing pawl moves along a path which is substantially circumferential with respect to the axis of the wheel 2, so that during reciprocatory turning of the leaf spring 3 the projection 4 will act to advance the wheel 2 by cooperating with the teeth 5 thereof.

Referring to FIG. 1, it will be seen that the leaf spring 3 is formed intermediate its ends with an elongated cutout 7 which extends substantially radially with respect to the axis of the pin 6, and a rotary shaft 9 whose axis coincides with that of the wheel 2 has an upwardly directed surface 16 in a plane normal to the common axis of the shaft 9 and the wheel 2, and the leaf spring 3 rests on this surface 16, the shaft 9 having an eccentric projection 8 of a thickness substantially equal to the width of the cutout 7 extending through the latter, as is evident from FIG. 3, so that during rotation of the shaft 9 in either direction the eccentric projection 8 will cooperate with the leaf spring 3 to angularly reciprocate the latter about the pin 6.

The leaf spring 3 has a second springy projection 10 which extends substantially radially with respect to the

3

axis of pin 6 upwardly into engagement with the teeth 5, and as is apparent from a comparison of FIGS. 1 and 4 when the leaf spring 3 reciprocates the projection 10 moves along the path which is substantially radial with respect to the axis of the wheel 2. The width of the projection 10 is such that during the reciprocation of the leaf spring between the extreme end positions thereof the projection 10 remains at all times in engagement with the teeth 5. Because of the fact that the projection 10 moves substantially radially with respect to the axis of the wheel 2, the projection 10 acts as a pawl which prevents return movement of the wheel 2, while the projection 4 acts as a pawl which advances the wheel 2, as was pointed out above, and thus in the single simple leaf spring 3 both of these pawls are included.

The outer end of the projection 11 which is accessible to the operator is knurled as indicated at 12 so that the operator by pressing a thumb, for example, against the knurled ring 12 can turn the wheel 2 in order to zero the latter. The numerals Z carried by the wheel 2 are indicated in FIGS. 1 and 4, and the wall of the element 1 is formed with a cutout 13 through which these numerals are visible, the window 13 being provided at an edge with an index which cooperates with the scale Z. As is shown in FIG. 3, an additional window 14 may be provided and a scale of numerals may be located at the exterior periphery 15 of the wheel 2 so as to be visible through the window 14, so that the user has the option of viewing the counter either through the window 13 or the window 14, although either one by itself will suffice. Furthermore, it is possible to arrange the periphery 15 of the wheel 2 so that this periphery extends in part into and even in part through the window 14, and this periphery 15 may be knurled so that the operator can turn the wheel 2 by engaging such a knurled periphery thereof through the window 14.

As is evident from FIG. 3 the wheel 2 is provided at its outer periphery with an annular axially extending rim which directly engages the underside of the wall of the element 1 so that in this way the wheel 2 is maintained parallel to this wall. The springy projections 4 and 10 in addition to serving as advancing and holding pawls, respectively, serve to press the wheel 2 upwardly toward the wall of the element 1 so that these springy projections 4 and 10 additionally function to support the wheel 2 while the latter is guided for turning movement. The leaf spring 3 is provided with a pair of additional projections 17 and 18 which participate in the supporting of the wheel 2 in its position where its rim engages the underside of the wall of the element 1. Thus, as may be seen from FIG. 1, the springy projections 17 and 18 are respectively located on opposite sides of the axis of the wheel 2 and they have convexly curved free end portions directly engaging a smooth downwardly directed surface of the wheel 2, so that the projections 4, 10, 17 and 18 provide a four-point support for the wheel 2. The springy projections 4, 10, 17 and 18 additionally serve to press the leaf spring 3 against the surface 16 of the shaft 9. Since the shaft 9 is mounted only for rotation and cannot shift axially, the plane in which the surface 16 is located remains unchanged and thus the location of the leaf spring 3 is accurately determined, and it is unnecessary to provide at the pin 6 anything in engagement with the underside of the spring 3, as viewed in FIG. 3, since the surface 16 functions to maintain the spring 3 at the elevation illustrated in FIG. 3.

During one revolution of the shaft 9 and thus of the eccentric projection 8 thereof the spring 3 will be reciprocated back and forth through a predetermined angle, as is evident from a comparison of FIGS. 1 and 4, and this angle is such that the wheel 2 will be advanced through an increment equal to the space between two of the indicia indicated by the scale Z. Thus, as may be seen from FIGS. 1 and 4 the wheel 2 has been advanced from the number 18 to the number 17. The numbers go down to

4

indicate to the user how many exposures are left in the roll of film, when the structure is used as part of a camera. In order to zero the wheel it is manually turned by manipulation of the knurled portion 12.

It should be noted that if desired an automatic zeroing of the wheel may be provided through a suitable spring which is tensioned during turning of the wheel 2 so that at the end of the use of the wheel 2 it is released to such a spring to return thereby to the zero position.

Referring to FIG. 5, there is shown therein a camera housing 19 carrying a cap 1 which corresponds to the element 1 described above and which serves as the housing for the viewfinder and counter structure. The rotary drive shaft 9 turnably supports the gear 20 which is freely turnable with respect to the drive shaft 9 and operating crank 21 is freely turnable on the gear 20 and around the shaft 9, this operating crank being manually operable by the operator for the purpose of advancing film and cocking the shutter in a well known manner. The crank 21 carries a pin 22 which bears against one end 26 of a spring 23 which is coiled around the shaft 9 and which has its other end 24 fixed as by a rivet 25 to the housing 1. In this way the spring 23 serves to hold the manually operable crank 21 in a rest position illustrated in FIG. 5.

A friction spring 27 which serves as a one-way drive is fixed at one end to the crank 21 and is coiled around a hub of the gear 20. When the crank 21 is turned in opposition to the spring 23 the spring 27 tightens on the hub of the gear 20 and turns the latter, while when the spring 26 returns the crank 21 to its rest position the spring 27 simply turns freely with respect to the gear 20 so that the latter is only moved in one direction. The gear 20 meshes with a gear 28 which is supported for free turning movement about its axis, and this gear 28 includes a pair of gear portions 29 and 30, the gear portions 29 meshing with the gear 20 while the gear portion 30 meshes with a pair of gears 31 and 32. The gear 32 forms part of the drive shaft 9 so that the rotation of the gear 20 is transmitted to the drive shaft 9 through the gear portions 29 and 30 and the gear 32.

The gear 31 is fixed to a shaft 33 which is supported for axial and rotational movement and which extends through a transporting film roller 37. The roller 37 is formed, as shown in FIGS. 5 and 6, with inwardly directed radial projections extending into notches 34 formed in the shaft 33, so that these projections 36 of the roller 37 in cooperation with the notches 34 of the shaft 33 serve as a clutch coupling the shaft 33 to the film advancing roll 37, and thus when the gear 31 is turned through the drive 20, 29, 28, 31 the rotation of the shaft 33 is transmitted to the roll 37 in order to advance the film. When all of the film frames have been exposed and it is desired to rewind the film, the operator presses against the lower free end portion of the shaft 33, and this lower free end portion being accessible at the bottom of the camera, and by upward pressure the shaft 33 is shifted upwardly in opposition to the leaf spring 35 so as to locate the notches 34 beyond the clutch projections 36 and thus the roll 37 is released from the shaft 33 and can turn in the opposite direction to permit the film to be rewound. The film is wound from the roll 37 onto a take-up spool 38 through which the drive shaft 9 extends, the drive shaft 9 carrying a leaf spring 39 which frictionally presses against the inner surface of the spool 38 so as to act as a friction clutch enabling the drive shaft 9 to turn the take-up spool and also to slip with respect thereto. A split ring 40 in a groove of the drive shaft 9 prevents axial shifting of the latter, as is evident from FIG. 5. When the operator releases the shaft 33 the spring 35 will return it to the operating position shown in FIG. 5 where the clutch 34, 36 is again engaged and the gear 31 meshes with the gear 28.

Each time the operator actuates the crank 21 to advance the film, the shaft 9 will be turned through a revolution so as to actuate the counter wheel in the manner described above. In order to further guarantee that the wheel 2

5

is coaxial with the shaft 9 the latter is provided with an axial projection 41 extending into an axial bore of the wheel 2, as shown in FIG. 5.

As was pointed out above a spring may be tensioned during use of the counter wheel for the purpose of automatically returning the latter to its zero position, and any suitable device in the form of an eccentric disc, system of levers, or the like may be provided for moving the projections 4 and 10 away from the counter wheel while pressing the projections 17 and 18 against wheel 2 when it is desired to release the wheel 2 to the zeroing spring which automatically zeroes the spring 2. For example, when the door of the camera is opened for the purpose of removing exposed film or introducing fresh film this door may actuate such an eccentric disc or system of levers for the purpose of removing the projections 4 and 10 from the wheel while maintaining projections 17 and 18 pressed thereagainst, and thus the spring will automatically zero the wheel in this case when the camera door is opened.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of counters differing from the types described above.

While the invention has been illustrated and described as embodied in counters for cameras, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. For use in a counter, a leaf spring oscillatably mounted on a given axis and having a pair of springy projections angularly spaced from each other about said axis, one of said projections extending at a substantial distance from said axis and movable substantially circumferentially with respect thereto and being an advancing pawl for advancing a counter wheel and the other of said projections extending substantially radially a shorter distance from said axis and remaining substantially stationary with respect thereto and being a retaining pawl for preventing the wheel from turning back after it is advanced by said one projection.

2. In a counter assembly, in combination, a counter wheel having a row of teeth arranged along a circle which has a first axis; guide means guiding said wheel for turning movement about said first axis; a leaf spring having a pair of springy projections respectively engaging said teeth of said counter wheel, said guide means guiding said leaf spring for turning movement about a second axis parallel to and spaced from said first axis and one of said projections of said leaf spring extending substantially circumferentially with respect to said second axis and moving during reciprocation of said leaf spring about said second axis along a path which is substantially circumferential with respect to said first axis and the other of said projections of said leaf spring extending substantially radially with respect to said second axis and, when said leaf spring reciprocates about said second axis, moving along a path which extends substantially radially with respect to said first axis, so that during the reciprocation of said leaf spring about said second axis in one direction said one projection will advance the counter wheel while the said other projection cooperates with said teeth to prevent turning back of the counter wheel during reciprocation of said leaf spring in an opposite direction;

6

and means cooperating with said leaf spring for reciprocating the latter back and forth about said second axis through an angle which will advance said counter wheel through a predetermined increment at each reciprocation of said leaf spring about said second axis.

3. In a counter assembly, in combination, a counter wheel having a row of teeth arranged along a circle which has a first axis; guide means guiding said wheel for turning movement about said first axis; a leaf spring having a pair of springy projections respectively engaging said teeth of said counter wheel, said guide means guiding said leaf spring for turning movement about a second axis parallel to and spaced from said first axis and one of said projections of said leaf spring extending substantially circumferentially with respect to said second axis and moving during reciprocation of said leaf spring about said second axis along a path which is substantially circumferential with respect to said first axis and the other of said projections of said leaf spring extending substantially radially with respect to said second axis and, when said leaf spring reciprocates about said second axis, moving along a path which extends substantially radially with respect to said first axis, so that during the reciprocation of said leaf spring about said second axis in one direction said one projection will advance the counter wheel while the said other projection cooperates with said teeth to prevent turning back of the counter wheel during reciprocation of said leaf spring in an opposite direction; and means cooperating with said leaf spring for reciprocating the latter back and forth about said second axis through an angle which will advance said counter wheel through a predetermined increment at each reciprocation of said leaf spring about said second axis, said means for reciprocating said leaf spring including a rotary shaft whose axis coincides with said first axis, said shaft having a surface normal to said first axis on which said leaf spring rests and said shaft having an eccentric projection extending from said surface thereof against which said leaf spring rests, said leaf spring being formed with an elongated cutout through which said eccentric projection extends and the width of said cutout being substantially equal to the thickness of said eccentric projection so that when said shaft turns about its axis said eccentric projection will cooperate with said leaf spring to reciprocate the latter about said second axis.

4. In a counter assembly, in combination, a counter wheel having a row of teeth arranged along a circle which has a first axis; guide means guiding said wheel for turning movement about said first axis; a leaf spring having a pair of springy projections respectively engaging said teeth of said counter wheel, said guide means guiding said leaf spring for turning movement about a second axis parallel to and spaced from said first axis and one of said projections of said leaf spring extending substantially circumferentially with respect to said second axis and moving during reciprocation of said leaf spring about said second axis along a path which is substantially circumferential with respect to said first axis and the other of said projections of said leaf spring extending substantially radially with respect to said second axis and, when said leaf spring reciprocates about said second axis, moving along a path which extends substantially radially with respect to said first axis, so that during the reciprocation of said leaf spring about said second axis in one direction said one projection will advance the counter wheel while the said other projection cooperates with said teeth to prevent turning back of the counter wheel during reciprocation of said leaf spring in an opposite direction; and means cooperating with said leaf spring for reciprocating the latter back and forth about said second axis through an angle which will advance said counter wheel through a predetermined increment at each reciprocation of said leaf spring about said second axis, said projections of said leaf spring maintaining said wheel in engagement with said guide means to be guided by the latter.

5. In a counter assembly, in combination, a counter wheel having a row of teeth arranged along a circle which has a first axis; guide means guiding said wheel for turning movement about said first axis; a leaf spring having a pair of springy projections respectively engaging said teeth of said counter wheel, said guide means guiding said leaf spring for turning movement about a second axis parallel to and spaced from said first axis and one of said projections of said leaf spring extending substantially circumferentially with respect to said second axis and moving during reciprocation of said leaf spring about said second axis along a path which is substantially circumferential with respect to said first axis and the other of said projections of said leaf spring extending substantially radially with respect to said second axis and, when said leaf spring reciprocates about said second axis, moving along a path which extends substantially radially with respect to said first axis, so that during the reciprocation of said leaf spring about said second axis in one direction said one projection will advance the counter wheel while the said other projection cooperates with said teeth to prevent turning back of the counter wheel during reciprocation of said leaf spring in an opposite direction; and means cooperating with said leaf spring for reciprocating the latter back and forth about said second axis through an angle which will advance said counter wheel through a predetermined increment at each reciprocation of said leaf spring about said second axis, said projections of said leaf spring maintaining said wheel in engagement with said guide means to be guided by the latter and said leaf spring having a pair of additional projections engaging said wheel to maintain the latter in engagement with said guide means, so that said leaf spring provides a four-point support for said wheel.

6. In a counter assembly, in combination, a counter wheel having a row of teeth arranged along a circle which has a first axis; guide means guiding said wheel for turning movement about said first axis; a leaf spring having a pair of springy projections respectively engaging said teeth of said counter wheel, said guide means guiding said leaf spring for turning movement about a second axis parallel to and spaced from said first axis and one of said projections of said leaf spring extending substantially circumferentially with respect to said second axis and moving during reciprocation of said leaf spring about said second axis along a path which is substantially circumferential with respect to said first axis and the other of said projections of said leaf spring extending substantially radially with respect to said second axis and, when said leaf spring reciprocates about said second axis, moving along a path which extends substantially radially with respect to said first axis, so that during the reciprocation of said leaf spring about said second axis in one direction said one projection will advance the counter wheel while the said other projection cooperates with said teeth to prevent turning back of the counter wheel during reciprocation of said leaf spring in an opposite direction; and means cooperating with said leaf spring for reciprocating the latter back and forth about said second axis through an angle which will advance said counter wheel through a predetermined increment at each reciprocation of said leaf spring about said second axis, said guide means including a pin extending along said second axis, having a portion of reduced diameter extending freely through and

beyond said leaf spring and having a shoulder against which said leaf spring bears.

7. In a camera, in combination, a top wall having an underside and a topside, said top wall of said camera being formed with an opening passing therethrough; a counter wheel engaging said underside of said top wall and having an axial projection extending through said opening thereof so that said top wall guides said wheel for rotary movement about its axis, said wheel having a circle of teeth directed away from said underside of said top wall and arranged coaxially with respect to said wheel; a pin fixedly carried by said top wall and located adjacent but beyond said wheel, said pin extending away from and engaging said underside of said top wall and having an axis parallel to that of said wheel, said pin being formed intermediate its ends with a shoulder directed away from said underside of said top wall and having beyond said shoulder a portion of reduced diameter, said pin and wheel being located on the same side of said top wall; a leaf spring formed with an opening through which said portion of reduced diameter of said pin extends, said leaf spring engaging said shoulder of said pin to be guided by the latter for turning movement around the axis of said pin, and said leaf spring having an end distant from said pin on the side of said wheel axis opposite from said pin provided with an advancing projection engaging said teeth and moving substantially circumferentially with respect to said wheel axis during turning of said leaf spring around said pin axis through a given angle, said leaf spring having between said wheel axis and pin axis a holding projection engaging said teeth and moving substantially radially with respect to said wheel axis during turning of said leaf spring through said angle about said pin axis, and said spring being formed intermediate its ends with an elongated cutout extending substantially radially with respect to said pin axis and through which said wheel axis extends; a rotary drive shaft coaxial with said wheel and having a surface normal to said wheel axis directed toward said wheel and engaging said leaf spring at a face of the latter which is directed away from said wheel, said drive shaft having an eccentric projection extending from said surface thereof through said cutout of said leaf spring and having a thickness substantially equal to the width of said cutout, so that during rotary movement of said drive shaft said leaf spring will reciprocate around said pin axis to advance said wheel with said advancing projection to prevent return movement of said wheel with said holding projection.

8. In a camera as recited in claim 7, said spring having a pair of additional projections located on opposite sides of said wheel axis and engaging said wheel and urging the latter toward said underside of said top wall so that said spring provides four-point support for said wheel.

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