May 27, 1941. C. MIKUS 2,243,391

APPRATUS FOR RAISING AND LOWERING PROJECTION SCREENS

Filed April 25, 1939

Fig. 1

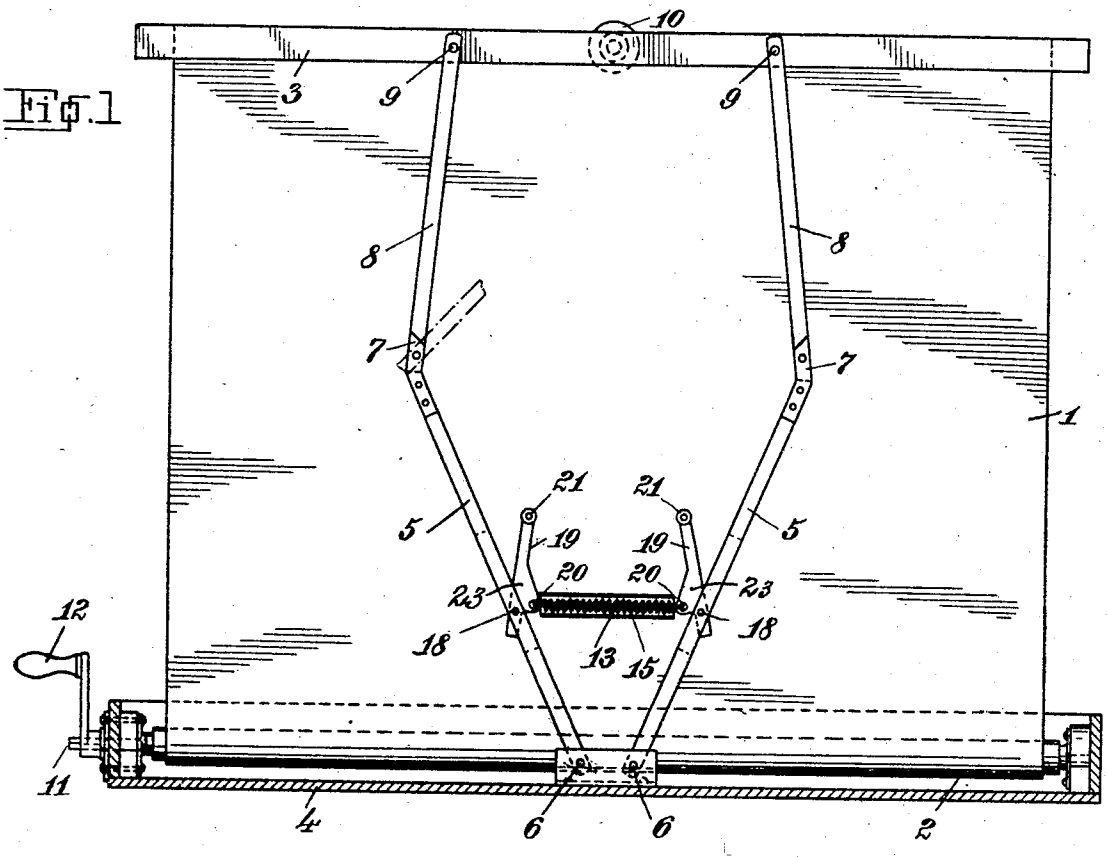


Fig. 2

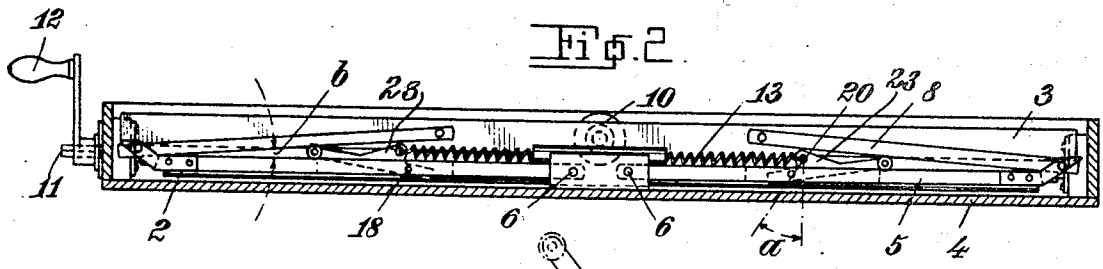


Fig. 3

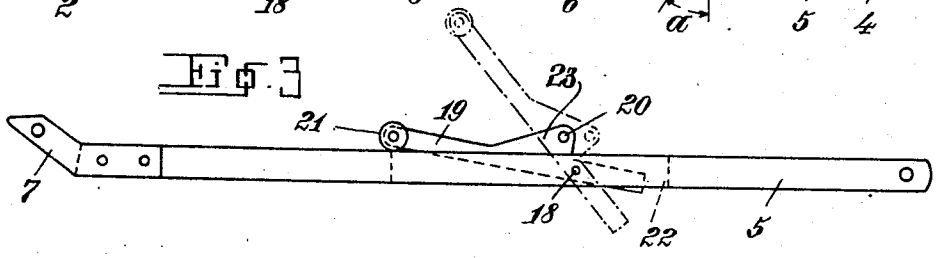
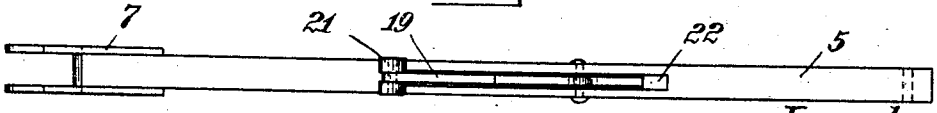


Fig. 4



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Patented May 27, 1941

2,243,391

UNITED STATES PATENT OFFICE

2,243,391

APPARATUS FOR RAISING AND LOWERING PROJECTION SCREENS

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Application April 25, 1939, Serial No. 269,875
In Germany December 24, 1938

3 Claims. (Cl. 88—24)

The invention relates to a device for raising and lowering a projection screen of that type in which the lower end of the projection screen is fixed to a roll equipped with a rolling spring, said roll being journaled in a box, a ledge on the upper end of the projection screen being connected with the bottom of the box by two knee jointed levers, the lower arms of these levers being connected the one with the other by a pull spring, so that the joints move the one towards the other when the projection screen is being raised.

This invention differs from devices of a similar kind in that the limitation of the movement of the joints of the knee jointed levers the one towards the other is effected by two simultaneously effective measures which, as regards effect, assist the one the other and relieve the joints from excessive stressing and, if necessary for instance when one of the two measures should fail, the other measure is still sufficient to ensure the necessary limitation of the approaching movement of the two joints.

One of the these measures consists in that an extension of the upper arm of each knee jointed lever bears against the upper end of the corresponding lower arm, and the other measure consists in that a protection tube surrounding a spring, which pulls together the lower arms of the levers, bears with each of its end faces against auxiliary levers, pivotally mounted on each of the lower arms of the knee jointed levers.

Owing to this arrangement the projection screen is not exposed to excessive pull tension if for instance the ends of the projecting tube should be worn, because in this instance the extension of the upper arms of the knee jointed levers bear against the surfaces of the lower arms. On the other hand the bearing pressure of these extensions are relieved by the action of the ends of the protecting tube.

An embodiment of the invention is illustrated by way of example in the accompanying drawing, in which

Fig. 1 shows the raised projection screen with the knee jointed levers extended.

Fig. 2 shows the box in longitudinal section, the projection screen being lowered.

Fig. 3 shows in side elevation the lower arm of the left hand knee jointed lever with the auxiliary lever.

Fig. 4 is a top plan view of Fig. 3.

In the example illustrated the projection screen 1 is secured at its lower end in known manner to a winding roller 2 acted upon by a spring not shown in the drawing, whereas the upper end of the screen is secured to a bar 3. The roller 2 is journalled in a box 4 which is closable in the usual manner by means of a lid not shown in the drawing.

Approximately in the middle of the box 4 and near the bottom thereof the lower ends of the lower arms 5 of the knee jointed levers are oscillatable in bearings 6, whereas the upper arms 8 of the knee jointed levers connected to the arms 5 by the joints 7 are secured near the middle of the bar 3 by means of pivots 9. A handle 10 is preferably arranged in the middle of the bar 3, and the shaft 11 of roller 2 has a crank 12 to facilitate the raising and lowering operations in the case of projection screens of very large dimensions.

A pull spring 13 is connected to the lower arms 5 of the knee jointed levers through the intermediary of auxiliary levers 19, pivotable about pins 18 on the lower arms 5 of the knee jointed levers. The ends of the springs 13 are connected to the auxiliary levers 19 at the points 20 which lie slightly outside the pivot points 18 at the nose 23 of the auxiliary levers 19. The auxiliary levers 19 are equipped with rollers 21 at their free ends.

The arrangement and size of the auxiliary levers 19 and especially the spacing between the pivot points 18 and the spring fixation points 20 is so chosen that the tension of the spring 13 is not sufficient, when the screen is rolled up (Fig. 2), to oscillate the auxiliary levers 19 through the angle α shown in Fig. 2 in opposition to the weight acting thereon of the aggregate formed by the parts 1, 3, 10, 8, 5, 13, 15, 19, one arm of this angle being formed by the connecting line between the points 18, 20 and the other by the vertical passing through the point 20.

If the screen rolled up as illustrated in Fig. 2 is raised by turning the crank 12, the auxiliary levers 19 are relieved and the spring 13 compressed and assists the upward movement of the screen in that it turns the auxiliary levers in contracting. The rollers 21 at the same time press against the under side of the arms 8 of the knee jointed levers and roll thereon. At the same time, on passing the angle α, a certain dead centre position is overcome and consequently the action of the springs 13 on the auxiliary levers 19 is progressively assisted until, on attaining a predetermined extended position, the upper arms 8 of the knee jointed levers move away from the rollers 21, and the spring 13 only

exerts a pulling action on the lower arms 5 of the knee jointed levers through the intermediary of the auxiliary levers 19.

In Fig. 3 one of the auxiliary levers is shown in its position of rest and in dotted lines in its position when leaving the dead centre position. To enable the auxiliary lever to attain its lowermost extreme position the associated arm 5 has a slot 22.

Therefore, according to the invention, the strength of the spring 13 is chosen so that in tensioned state (Fig. 2) it is not capable of overcoming the resistance formed by the sharp angle *b* of the arms 5, 8 of the knee jointed levers plus the resistance of the winding spring in the roller 2, whereas it is capable of doing so when the uppermost part of the projection screen 1 has been raised slightly out of the box by lifting the bar 3, the auxiliary lever 19 cooperating with and assisting the spring by exerting pressure on the upper knee lever arms 8.

On attaining a certain height during the upward movement the weight of the above mentioned aggregate acting on the knee lever movement maintains equilibrium with the tension of the spring 13 attained in this position. As the bar 3 continues its upward movement, the knee lever angle finally becomes so obtuse that the remaining contraction of the spring 13 is sufficient to effect the complete raising of the projection screen.

Furthermore the contacting of the upper lever arms 8 with the rollers 21 during the rolling of the projection screen effects a shock absorption which ensures the screen 1 moving gently into its position of rest.

A motor or some other driving device acting on the spring shaft 11 may be used instead of the crank 12.

In certain instances the use of the tube 15 slipped over the pull spring may be dispensed with and the limitation in the extended position may be attained by the auxiliary levers bearing correspondingly against their coordinated knee lever arms 5.

I claim:

1. Raising and lowering means for projection screens comprising in combination, a box, a spring roller journaled in the box, a projection screen wound on said roller, a bar attached to the free edge of the screen, two pairs of jointed levers comprising upper and lower arms and having corresponding ends adjacently pivoted to the box substantially midway the ends of the box, the other corresponding ends of said levers being pivotally connected to the bar at the free edge of the screen, the lever arms of each pair overlying each other and the joints between the lever arms moved outwardly of each other when the screen is wound on said spring roller, an auxiliary lever pivoted adjacent one end to the lower lever arm of each pair of jointed levers and having its free end overlying the lower lever arm and engaged with the adjacent overlying upper lever arm when the jointed levers are folded and the projection screen is retracted, and a spring connecting the auxiliary levers for normally urging the free ends of the auxiliary levers into raising engagement with the upper lever arms of the jointed levers.

2. Raising and lowering means for projection screens as specified in claim 1, wherein a rigid tube encloses the spring connection between the auxiliary levers and is adapted to be engaged at its ends by the auxiliary levers for limiting movements of the lower lever arms towards each other and the distance of raising movement of the screen.

3. Raising and lowering means for projection screens as specified in claim 1, wherein the connections of the ends of the spring with the auxiliary levers is slightly above the auxiliary lever pivots.

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