Oct. 5, 1965 R. H. APPELDORN ETAL 3,209,646

PORTABLE OVERHEAD PROJECTING APPARATUS

Filed July 20, 1962 3 Sheets-Sheet 1

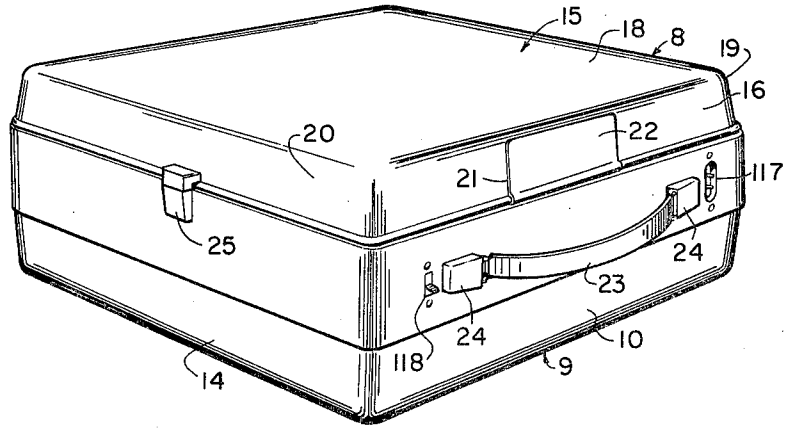


FIG. 1

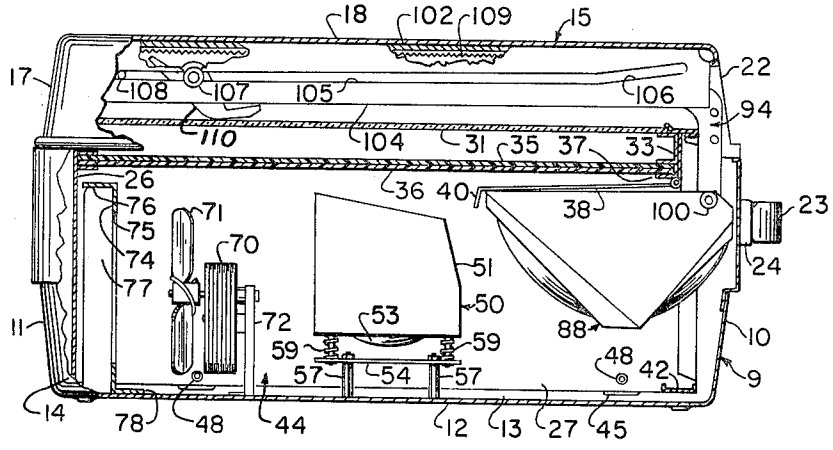


FIG. 2

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PORTABLE OVERHEAD PROJECTING APPARATUS

Filed July 20, 1962 3 Sheets-Sheet 2

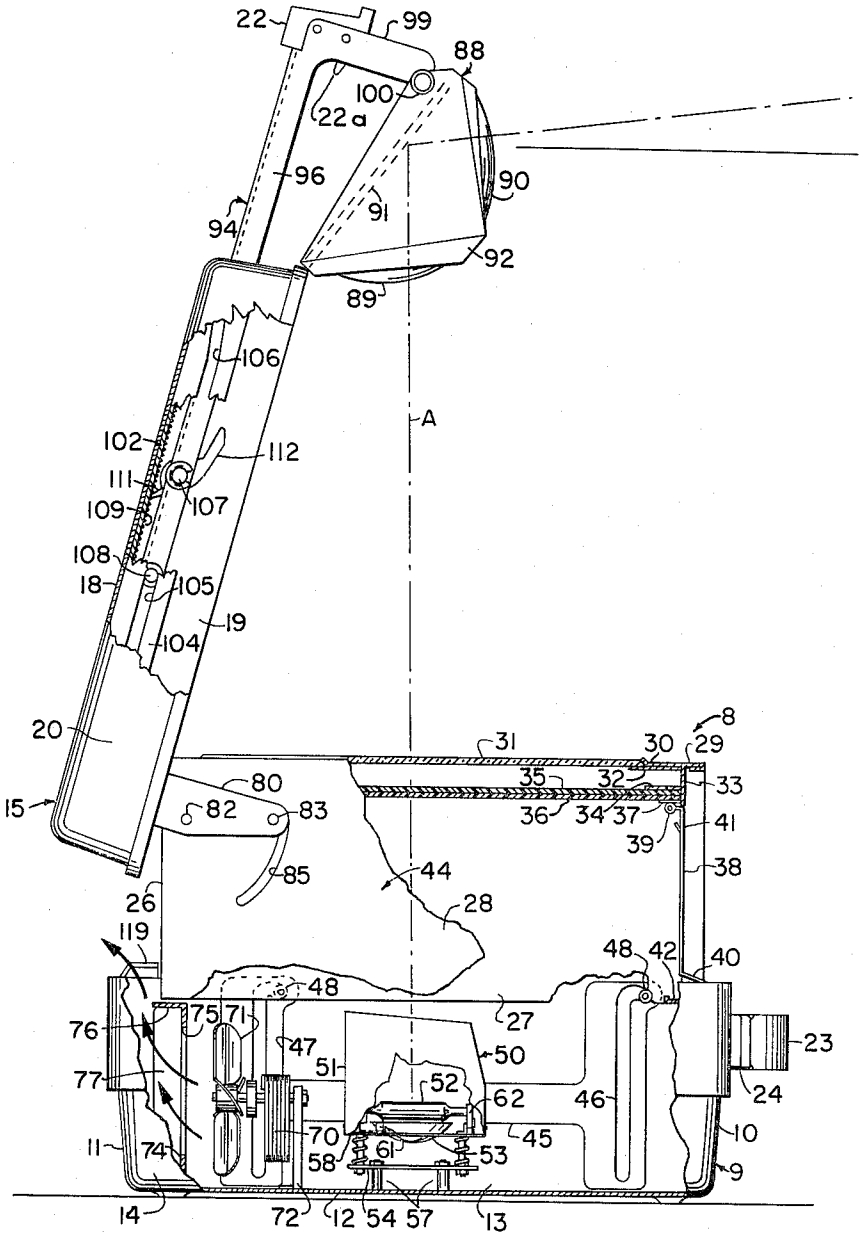


FIG. 3

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3 Sheets-Sheet 3

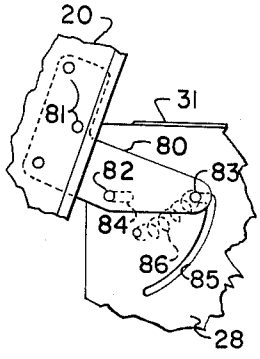


FIG. 5

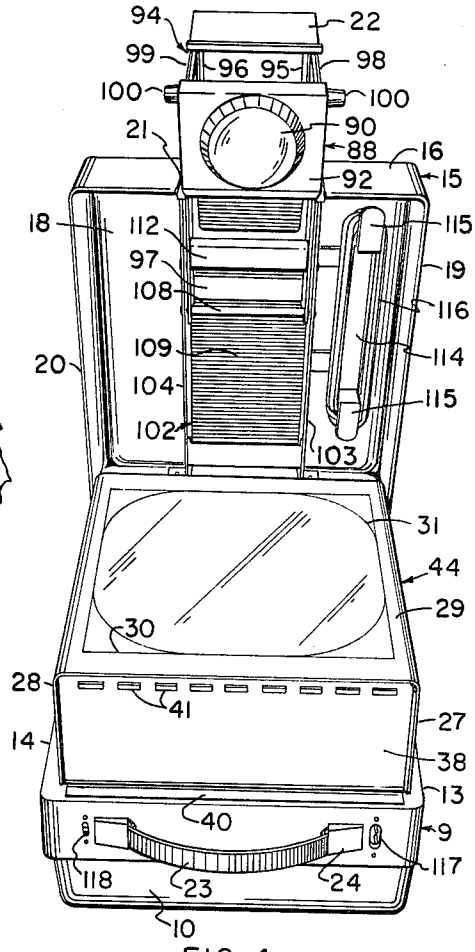


FIG. 4

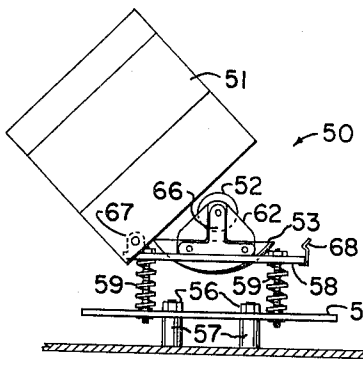


FIG. 6

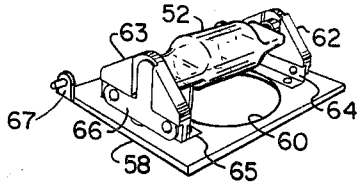


FIG. 7

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United States Patent Office 3,209,646 Patented Oct. 5, 1965

3,209,646
PORTABLE OVERHEAD PROJECTING APPARATUS

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Filed July 20, 1962, Ser. No. 211,956
7 Claims. (Cl. 88—24)

This invention pertains to apparatus for the projection of images from film transparencies onto a remote screen. In particular, the present invention is concerned with apparatus which is commonly called an overhead projector, and with those overhead projectors in which the parts are folded within a carrying case and easily carried about by a person using only one hand.

Prior projectors of the type named have been objectionable because many models have been extremely bulky and heavy even when collapsed in carrying position. This has been a result of several features existing in the prior machines such as the long light path from the light source to the stage, the added lenses and mirrors used in directing the usable light to the stage, and the large projection heads used above the stage which require more space to store the same when in folded carrying positions. Another objectionable feature existing on present machines of this general nature is the fact that parts have to be removed and attached in different locations when the machines are folded to carrying position and opened to operating position. This increases the risk of damage or breakage of the several parts which is commensurate with additional handling. Further, the prior overhead projectors have not been made so as to be able to accommodate transparencies of a size larger than about 7 inches by 7 inches, and, although machines which will accommodate transparencies of a size about 10 inches by 10 inches have been available, those larger machines have not been made in a size and shape so as to be conveniently transported by one person. That is, the size of the machine has been increased proportionally to the increase in size of the transparency, as the size of all the parts has increased.

The present invention has as its principal object the provision of improvements in overhead and similar projectors which make them convenient to carry about and quickly set up in operative position with great simplicity.

Other objects are to reduce the size of machines of the type named without reducing the size of the stage or transparency usable therewith, and to reduce the weight of the machine to about half the weight of existing machines.

The foregoing, as well as other objects and aspects of novelty of this invention, will become more apparent after a perusal of the following detailed description, especially when considered in connection with the accompanying drawing illustrating one embodiment of the invention, wherein:

FIGURE 1 is a perspective view of the improved projector with the parts thereof in closed or carrying position, so that the entire appartus can be easily transported;

FIGURE 2 is a side elevational view of the projector shown in FIGURE 1, with certain portions broken away to show parts located interiorly;

FIGURE 3 is a side elevational view similar to FIGURE 2, but showing the parts of the apparatus in opened or operating position, certain portions being broken away to show parts located interiorly;

FIGURE 4 is a perspective view of the front of the machine, showing the parts thereof in the open or operating position as in FIGURE 3;

FIGURE 5 is an enlarged detail view illustrating the hinge and locking construction for the cover;

FIGURE 6 is an enlarged front elevational view illustrating the light source and mounting means for the same, with the shield in raised position; and

FIGURE 7 is a perspective view of the light source and mounting means for the same, as illustrated in FIGURE 6, certain parts thereof being broken away for purposes of clarification.

Like reference numerals refer to like parts throughout the several views.

In the accompanying drawings and description of the embodiment of the invention shown, the end shown at the right in FIGURES 1, 2 and 3 will be referred to as the "front" of the machine, and the opposite end thereof will be referred to as the "back." The stem "top" refers to that portion of the machine which is uppermost in the several views, and the surfaces opposite from the top is called the "bottom" of the machine. The other two external surfaces are each called a "side" of the machine and are referred to by the terms "right" and "left" from the point-of-view of an operator facing the front of the machine. The position of the machine shown in FIGURE 1 will be referred to as the "carrying position" and the position of the machine shown in FIGURE 3 will be referred to as the "open (or operating) position."

Referring particularly to FIGURES 1 and 2, the portable overhead projector, generally designated **8**, comprises a lower box-like case or base structure **9** having a front wall **10**, a back wall **11**, a bottom plate **12** and right and left side walls **13** and **14** respectively. The base structure **9** has an upper open end enclosed by a cover **15** which is box-like in configuration and comprises a front wall **16**, a back wall **17**, a top plate **18** and right and left side walls **19** and **20** respectively. The front wall **16** of the cover **15** has a cut-away portion **21** in which is fitted a bridging plate **22** to be hereinafter described. A carrying handle **23** is secured by suitable fastening means **24** to the front wall **10** of the case **9**. Two component, manualy releasable interlocking latch means **25**, of a conventional nature, are affixed on each side of the cover **15** and case **9**, respectively, securing the same together in locked relation such that the case may be readily carried about by the handle **23** without any danger of the parts separating when in carrying position as shown in FIGURES 1 and 2.

Referring now to FIGURES 3 and 4, wherein the machine **8** is illustrated in the operating position, the cover **15** as shown is supported by a frame **44** which is substantially square in plan view. The frame **44** comprises a back wall **26** and transversely spaced side walls **27** and **28**. An upper plate **29** joins the walls **26**, **27** and **28** and has an enlarged square aperture **30** formed therein providing a generally open upper end for the frame **44**. A transparent stage **31**, which may be a flat piece of glass approximately 10 inches by 10 inches in size is fitted within the aperture **30**. The transparency to be projected is placed on top of the transparent stage **31**. The stage **31** is retained in the aperture **30** by horizontal flanges **32** of a pair of generally U-shaped transversely extending bars **33** (only one of which is shown) positioned and secured by suitable means, such as spot welding, to the under side of the plate **29** and adjacent the front and back edges of the stage **31**. As shown in FIGURE 3, the edges of the plate **29** forming the aperture **30** are bent slightly upwardly to engage the edges of the stage **31**. Two separate condensing Fresnel lenses **35** and **36**, formed from plastic and cemented together, are suitably mounted in parallel relation with respect to the stage **31** by a lower flange **34** of the bars **33** and by a second transverse bar **37**. The bar **33**, shown in FIGURES 3 and 4, is recessed rear-

wardly of the front edge of the side walls 27 and 28 providing a slight forward overhang for the upper plate 29.

In the operating position the front of the frame 44 is closed by a panel 38. The panel 38 is hingedly mounted at its upper edge by a transversely extending rod 39 secured at its ends to the side walls 27 and 28. Suitable spring means, not shown, may be positioned around the rod 39 and have the end portions thereof engageable with the panel 38 and the lower surface of the bar 37 to bias said panel into the position which is shown in FIGURE 3. The side walls 27 and 28 are formed with reversely bent portions at their forward edges, and the ends of said portions form abutting stops for the ends of panel 38. The panel 38 is provided with a forwardly bent flange portion 40 on the lower edge thereof, which portion extends to a position which is even with the forwardmost edges of walls 27 and 28. Small louver-like openings 41 are formed in the front of panel 38 allowing air passage into the frame 44. A transversely extending bar 42 is secured between the lower forward ends of the side walls 27 and 28 to maintain said forward ends in proper spaced relation.

The frame 44 is telescopically mounted with respect to the base member 9 by means of a pair of brackets 45, only one of which is shown in FIGURE 3, provided with vertically extending slots 46 and 47 in the opposite enlarged end portions thereof. The brackets are fixed to the side plates 13 and 14 and spaced therefrom a distance to accommodate the end portions of pins 48. The pins 48 are secured to the side walls 27 and 28 and extend outwardly therefrom through the slots 46 and 47 toward the side walls 13 and 14 of the base 9. The slots 46 and 47 have forwardly curved upper end portions which serve to guide the pins 48 and support frame 44 in the position which is shown in FIGURE 3. That is, in the position shown in FIGURE 3, the guide pins 48 rest in the upper end portions of the slots 46 and 47, thereby positioning the frame 44 forwardly of the vertically extending portions of said slots.

Within the box-like case 9, and mounted on the bottom plate 12 thereof, is a lamp assembly, generally designated 50. The lamp assembly 50 comprises a tubular light shield 51, having open upper and lower ends, a lamp 52, a dichroic reflector 53 and suitable mounting means for said components. As shown most clearly in FIGURES 3, 6 and 7, the mounting means comprises a lower flat plate 54 secured to the bottom plate 12 by means of four bolt and nut assemblies 56. The bolts project upwardly from the plate 12 through cylindrical spacers 57 positioned thereon to space plate 54 above the plate 12. A second plate 58 is mounted in generally parallel vertically spaced relation with respect to the plate 54 by means of four screws extending downwardly through openings formed therefor in the upper plate 58 and threadably received in suitable threaded openings in the plate 54. The plates 54 and 58 are held in spaced relation by helical compression springs 59 surrounding each of the screws 58 and thus forming a shock absorbing position adjustable mounting for the lamp 52.

The plate 58 has a centrally located circular aperture 60 formed therein which cradles the segment shaped reflector 53. The reflector 53 is retained in the aperture and is prevented from having vertical displacement by means of suitable S-shaped clips 61, only one of which is shown in FIGURE 3, but a plurality of said clips are mounted on the upper surface of the plate 58 and engage the upper surface of said reflector. The dichroic reflector 53 serves to absorb heat from the infrared rays of light emitted by the lamp 52 to reduce the heat in the incident beam of light directed toward the Fresnel lenses 35 and 36.

The lamp 52 is preferably a lamp having a quartz or high temperature glass envelope filled with iodine vapor and having a rating of about 330 watts. The lamp illustrated in the drawings is approximately 2⅜ inches in length and has a cylindrical central portion with flattened end portions and is preferably provided with a helical filament disposed within said envelope. The filament is not over ⅜ inch in length and 5/32 inch in coil diameter. Suitable contacts are provided on each end of the lamp 52, which contacts engage with matching contacts fitted in a pair of ceramic insulators 62 and 63 which are formed into a substantially triangular shape. The insulator 62 is attached to the plate 58 by means of an angle bracket 64, which bracket is suitably secured to said insulator and said plate. The bracket 64 is preferably formed of a resilient material, such as spring steel, to allow movement of the insulator 62 toward and away from the lamp 52, thus allowing easy insertion of said lamp on the contacts carried by the insulators and to bias the lamp into engagement with said contacts. The insulator 63 is rigidly attached to the plate 58 by a similar angle bracket 65 which is not resilient in nature. Electrical conductors or lead wires, not shown, are drawn upwardly through openings in the plate 58 below the insulators 62 and 63 and up through a groove formed in the outer vertical face of said insulators. The leads are then covered by T-shaped members 66, only one of which is shown in FIGURES 6 and 7, which members are formed of a suitable insulating material and secured by suitable fastening means to the insulators 62 and 63.

The light shield 51 is rectangular shaped and is pivotally mounted along one side to a pair of upstanding ears 67 on the plate 58. The lamp shield 51 serves to prevent light from the lamp 52 from striking frame 44, and the pivotal mounting therefor permits easy access to the lamp for replacement thereof. A resilient spring clip 68 is attached to the plate 58, and said clip serves to retain the shield 51 in the operative position in which it is shown in FIGURE 3.

A fan comprising a motor 70 and a set of blades 71, driven thereby, is mounted by means of a bracket 72 which is attached to the bottom plate 12 of the base 9. Positioned rearwardly of the fan blades 71 is a metal panel 74 which forms an air duct. The panel 74 extends transversely of the plate 12 and has a length slightly less than the spacing between the frame side walls 27 and 28. As shown most clearly in FIGURE 2, the panel 74 is formed with a circular opening 75, a rearwardly bent top flange 76 and rearwardly bent side flanges 77. The panel 74 is fixed in place by suitable fastening means, such as weldments, in order to join a forwardly bent flange 78 to the bottom plate 12, as is shown in FIGURE 2. The opening 75 is aligned with the fan so that air drawn by said fan through the louver-like openings 41 in the panel 38 is exhausted from the case 9 through said opening 75 into the back of said case, to be forced out the rear of the machine between the back wall 11 and the back wall 26, as is shown by the arrows in FIGURE 3. The air which is thus drawn through the frame 44 and case 9 serves to cool the Fresnel lenses 35 and 36 and the lamp assembly 50.

The cover 15, as aforementioned is supported by the frame 44 and hingedly mounted thereon. Plates 80, only one of which is shown in the drawing, see FIGURES 3 and 5, are secured at one end thereof to the side walls 19 and 20 of the cover 15 by means of rivets 81 or other suitable fastening means. The free ends of the hinge plates 80 are provided with spaced openings through which are received bolts 82 and 83. Collars or tubular spacers, not shown, are fitted on the projecting portions of the bolts 82 and 83 and are retained thereon by suitable nuts and washers, not shown. The spacers provide smooth bearing surfaces for the bolts and fit through a pair of slotted openings 84 and 85 formed in the side walls 27 and 28. The slot 84 is disposed horizontally, allowing forward and rearward movement of the bolt 82. The slot 85 is provided with a horizontally disposed upper portion having a length equal to that

of the slot 84, but the major portion of the slot 85 is arcuately shaped in order to allow pivotal movement of the bolt 83, hinge plate 80 and cover 15 about the bolt 82 when the same is positioned in the forward end of the slot 84.

Tension springs 86, only one of which is shown, are fixed at one end to the side plates 27 and 28 and are connected at their opposite ends to the bolts 83. The springs 86 serve to bias the bolts 82 and 83 toward the rear of the slot 84 and toward the rear of the horizontally disposed portion of slot 85 respectively. This serves to secure to cover 15 in the raised inclined position shown in FIGURES 3, 4 and 5. To lower the cover, the cover 15, hinge plates 80 and bolts 82 and 83 are pulled forwardly, against the bias of the springs 86, and said cover is pivoted downward about the bolt 82.

The cover 15 serves to adjustably support a generally triangular shaped projection head assembly 88 which is positioned vertically above the stage 31 when the machine is in operative position. The projection head 88 serves to bend the path of the light projected upwardly from the lamp 52 through the stage 31 and direct said light toward a remote screen. The projection head assembly 88 comprises a pair of concavo-convex meniscus lenses 89 and 90, and a rectangular mirror 91. The converging meniscus lenses 89 and 90 are mounted within a frame member 92, and are disposed in fixed relation with respect to the mirror 91. In the embodiment shown, the lenses 89 and 90 are disposed in equiangular relation with respect to the plane of the mirror 91. The respective planes in which the lenses are disposed form angles of 47½° with respect to the plane of said mirror, providing a projection angle of 95°. The lens assembly of the head shown has a fixed focal length of approximately 14 inches and said head is supported for vertical adjustment by means hereinafter described to suitably focus the image of the transparency on a remote screen. The head assembly 88 is also adapted for pivotal movement with respect to its support allowing the operator to move the projected image up and down the screen. The axis about which the assembly is pivoted is located such that in all positions throughout the pivotal movement the incident axial ray A, see FIGURE 3, passes through the lens element 89, substantially radially to the mean curvature thereof and is reflected from the mirror 91 through the center of the lens element 90. The pivot axis also allows the head assembly to swing slightly toward the stage 31 as it is pivoted in a counterclockwise direction to maintain the projected image in focus in all positions on the screen without requiring vertical movement of the entire assembly 88 with respect to said stage.

The head assembly 88 is supported on the cover 15 by suitable supporting means including a slidable yoke 94. The yoke 94 comprises a pair of elongated transversely spaced angle bars 95 and 96 joined at one end by a plate 97 and joined at their opposite end by the bridging plate 22. Arms 98 and 99 are integrally formed with the bars 95 and 96 respectively, at one end thereof and project laterally therefrom. The projection head 88 is pivotally mounted on the free ends of the arms 98 and 99 and said arms are formed with suitable openings through which project opposite end portions of a threaded shaft which is not shown in the drawings. A hollow cylindrical spacer, not shown, is positioned between the free ends of the arms 98 and 99 and is aligned with the openings formed therein to maintain said arms in spaced relation and in fixed relation to the frame 92 of the head assembly 88. The frame 92 is provided with aligned openings on each side thereof through which the ends of the shaft project. The openings in the frame 92 define the pivot axis for said head assembly 88. Threaded knobs 100, having knurled exterior surfaces, or other suitable means, are threaded onto the projecting ends of the threaded shaft to frictionally hold the head 88 in the desired tilted position on the arms 98 and 99. The head 88 has a predetermined pivotal movement with respect to said arms 98 and 99 and stop means, not shown, are provided on the frame 92 engageable with said arms to define the limits of said pivotal movement.

The yoke 94 is slidably supported on the cover 15 by a fixed channel shaped bracket 102 having side flanges 103 and 104. The bracket 102 is mounted centrally of the cover 15 and the flanges 103 and 104 thereof are provided with transversely bent end portions which are secured by suitable means to the front wall 16 and back wall 17 of said cover. The flanges 103 and 104 are formed to contain identical elongate slotted openings 105, and said openings serve as cam tracks. The openings 105 have an angularly extending portion 106 on one end thereof, which, when the machine is in the operating position as viewed in FIGURE 3, serves to maintain the head assembly 88 vertically and centrally positioned above the stage 31, so that it is aligned with the axial ray A of the projected light. The openings 105 receive therethrough the opposite ends of a pair of rods 107 and 108, and said rods are affixed to the yoke 94 so that they extend through the flanges of angle bars 95 and 96 which are parallelly arranged with the flanges 103 and 104.

A plate 109, preferably made of nylon or other suitable material, having transversely extending ridges and grooves formed on one surface thereof is cemented or otherwise fixed to the bracket 102 between the flanges 103 and 104. A pawl 110 is pivoted intermediate its ends on the shaft 107 and extends between the angle bars 95 and 96. A spring is positioned on the pawl 110 to bias one end 111 thereof into engagement with the ridges and grooves on the plate 109 as shown in FIGURE 3. The opposite end 112 thereof allows manual release of the pawl to lower the yoke 94.

As illustrated in FIGURE 4, a bracket 114 having upstanding end portions 115 is secured to the channel bracket 102. The end portions 115 are positioned such that an electric cord 116 may be wrapped thereabout when the machine 8 is in carrying position. In operating position the cord 116 is removed from the position shown in the drawing and one end thereof is connected to a socket 117, including a pair of contacts, mounted on the front wall 10 of the case 9. The opposite end of the cord 116 may be connected to a conventional electrical outlet. The machine 8 has a relatively simple electrical circuit to the lamp 52 and fan motor 70 and a single on-off switch 118 mounted on the front wall 10 of the case 9.

In the operative position shown in FIGURE 3, with the frame 44 extended or raised above the base 9, the lower Fresnel lens 36 is positioned preferably 7 inches above the position of the filament of lamp 52. The head 88 is at a height above the Fresnel lens 35, a distance such that the image of the lamp filament is located within said head. The distance of the image of the lamp filament above the Fresnel lens 35 is preferably about 17⅞ inches or about 17⅛ inches above the stage 31. The head 88, in the operative position, will have a range of vertical adjustment above the stage 31 such that the distance between lens 89 and the stage 31 may vary between about 13 inches and 15$\frac{9}{16}$ inches and the image of the lamp filament will be positioned in said head. The projection head assembly 88 is adjustably positioned vertically above the stage at a height sufficient to focus the image on a remote screen. The vertical position of the head 88 is adjusted by the slidable yoke 94 and is held in the desired position by the pivoted pawl 110 engageable with the plate 109. The head 88 is then pivotal to raise or lower the projected image on the screen and further vertical adjustment of said head when the image is raised is unnecessary to maintain the image in focus.

When folding the machine 8 to the carrying position shown in FIGURES 1 or 2 from the position shown in

FIGURES 3 and 4, the operator first lowers the cover 15 by drawing it forward so it pivots about bolts 82 from the inclined to the horizontal position. With the cover 15 in the horizontal position the end portion 112 of pawl 110 engages the stage 31 and the opposite end 111 is drawn out of engagement with the grooves on plate 109. The yoke 94 may then be slid into the cover 15 toward the back wall 17 until the bridge plate 22 is flush with the front wall 16 in the opening 21. As the yoke 94 is slid or pushed into the cover the head 88 will engage the panel 38. Engagement of the head 88 with the panel 38 will pivot the same inwardly against the bias of the springs allowing the head to slide into the frame 44 under the lenses 35 and 36 to its stored or carrying position.

After storing the head assembly as above described, the operator may grasp the side walls 19 and 20 of the cover 15 and raise the cover and frame 44 slightly to guide the pins 48 in the curved path of the upper portions of slots 46 and 47 in the brackets 45. This will cause slight rearward movement of the frame and cover to a position such that the back wall 26 of said frame will be positioned rearwardly of the flanges 76 and 77 of the air duct 74. The frame 44 is then positioned to telescope downward into the case 9 with pins 48 being guided by the vertically extending portions of slots 46 and 47 to the carrying position shown in FIGURES 1 and 2.

The projection head 88 will slide into the case 9 directly behind the front wall 10 of said case when the bridging plate 22 is flush with the front wall 16 of the cover 15. Swinging movement of the head 88 in a downward direction is prevented by the engagement of the stop means on the head with the arms 98 and 99. Small lugs 22*a*, which are formed integrally with the bridging plate 22, slide under the front edge of the top plate 29 of the telescoping frame 44 and serve to prevent vertical movement of the cover 15 with respect to said frame.

As the frame 44 is telescoped into the case 9 the two components of the spring locks 25 are interfitted which lock the cover in position enclosing the upper open end of the case 9 and the machine 8 may be readily carried about without any danger of the cover becoming opened or any of the several components of said machine moving about within the case. It will be noted that in the carrying position there are no ventilation openings or other openings into the case which will allow dust or dirt to enter the case. Further, the cover fits tightly onto the case 9, and moldings as illustrated at 119 on the upper rear edge of the right wall 13 of the case 9 extending along the upper edges of the side walls of said case, provide a sealing engagement between said cover and case making the same substantially dust proof.

While one embodiment of the invention has been shown and described, it will be appreciated that this is for the purpose of illustration and that changes and modifications can be made therein without departing from the spirit and scope of the invention.

What is claimed as the invention is:

1. In a projector the combination comprising a box-like base member having an open upper end, a frame section having open upper and lower ends telescopically movable mounted with respect to said base member, a transparent object supporting stage carried by said frame at the open upper end thereof, a light source mounted in said base member, condensing lens means carried by said frame below said stage and above said light source to directly gather light produced thereby, and a projection head adjustably mounted on said frame section above said stage.

2. In a projector the combination comprising a box-like base member having an upper open end, a frame section having open upper and lower ends mounted for relative telescopic movement with respect to said base member, a transparent object supporting stage carried by said frame at the open upper end thereof condensing lens means carried by said frame below said stage, a light source mounted within said base member beneath said lens means, said frame section having a first raised position and a second lowered position with respect to said base member, a cover for the open upper end of said base member adapted to enclose said frame within said base member when said frame is in said second position, means swingably supporting said cover on said frame, and a projection head adjustably carried by said cover.

3. In a projector the combination comprising a box-like base member having an open upper end, a transparent stage supported by said base member above said open upper end, condensing lens means supported by said base member below said stage, a cover for the open upper end of said base member, said cover being movable between a first inclined position with respect to said stage and a second lowered position in which said cover encloses said stage and said base member, a projection head, means for slidably mounting said head on said cover affording vertical movement of said head with respect to said stage when said cover is fixed in said first position, and means for pivoting said head with respect to said cover to raise and lower a projected image.

4. In a projector the combination comprising a box-like base member having an open upper end, a transparent stage supported by said base member above said open upper end, condensing lens means supported by said base member below said stage, a cover for the open upper end of said base member, said cover being movable between a first inclined position with respect to said stage and a second lowered position in which said cover encloses said stage and said base member, a projection head, means for mounting said head on said cover for movement relative thereto and for vertical movement relative to said stage when said cover is fixed in said first position and for movement generally parallel with respect to said stage when said cover is fixed in said second position allowing movement of said head to a storage position below said lens means.

5. A portable overhead projector comprising a box-like base member having an open upper end, a frame having open upper and lower ends mounted for telescopic movement relative to said base member, a transparent object supporting stage carried by said frame at the open upper end thereof, condensing lens means carried by said frame and positioned therewithin below said stage, a panel hingedly supported by said frame adjacent said stage, means for biasing said panel to a position closing one side of said frame, said frame having a raised position and a lowered position with respect to said base member, a cover for the open upper end of said base member hingedly carried by said frame adjacent a second side thereof opposite from said panel, a light source mounted within said base member below said stage, a projection head pivotally and slidably suported by said cover, said cover having a first inclined and a second substantially parallel position with respect to said stage such that in said first position said head may be positioned vertically above said stage, said head being slidable within said frame through said panel with the cover in said second position and said cover being adapted to enclose said frame and said head within said base member when said frame is in said lowered position.

6. A portable overhead projector comprising in combination a box-like base member having an open upper end, a frame having open upper and lower ends telescopically mounted on said base member for movement relative thereto, said frame being movable between a raised position and lowered position relative to said base member, a transparent object supporting stage carried by said frame at the open upper end thereof, condensing lens means carried by said frame and positioned therewithin below and parallel to said stage, a panel hingedly mounted on said frame adjacent the upper end thereof and adapted to close one side thereof, a light source mounted

within said base member beneath said lens means, a cover for the open upper end of said base member hingedly mounted on said frame adjacent a second side thereof opposite from said panel, said cover having a first inclined position relative to said stage and a second lowered position covering said stage, a yoke slidably mounted with respect to said cover, releasable latch means for holding said yoke in selected adjusted positions when said cover is in said first position, a projection head, said projection head being pivotally mounted on one end of said yoke, said yoke affording vertical movement of said head relative to said stage when said cover is in said first position, said head being movable to a carrying position within said frame through said one side thereof when said cover is in said second position and said frame is in said raised position, said cover being adapted to enclose said frame within said base member when said frame is in said lowered position, and means for securing the cover in closed position on said base member.

7. A portable overhead projector comprising in combination a box-like base member having an open upper end, a frame having open upper and lower ends telescopically mounted on said base member for movement relative thereto, said frame having a raised position and a lowered position relative to said base member, a transparent object supporting stage carried by said frame at the open upper end thereof, a pair of Fresnel condensing lenses carried by said frame and positioned below and parallel to said stage, a panel hingedly mounted on said frame adjacent the upper end thereof and adapted to close one side thereof, a light source mounted within said base member beneath said lens means, a cover hingedly mounted on said frame adjacent a second side thereof opposite from said panel, said cover having a

first inclined position relative to said stage and a second lowered parallel position relative to said stage, a yoke slidably mounted with respect to said cover, a projection head assembly comprising a mirror and a pair of converging lenses supported in opposing symmetrical relation with respect to said mirror, said head being carried by said yoke affording vertical movement of said head with respect to said stage when said cover is in said first position to permit proper focusing on a remote screen, and said yoke affording movement of said head generally parallel to said stage when said cover is in said second position to permit movement of said head to a position below said condensing lenses through said one side of said frame, said cover being adapted to enclose said frame and said head within said base member when said frame is in said lowered position, and means for securing said cover to said base member in the enclosing position.

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