Aug. 10, 1943. A. A. LEONARD 2,326,542

PHOTOGRAPHIC ENLARGER

Filed Feb. 12, 1941

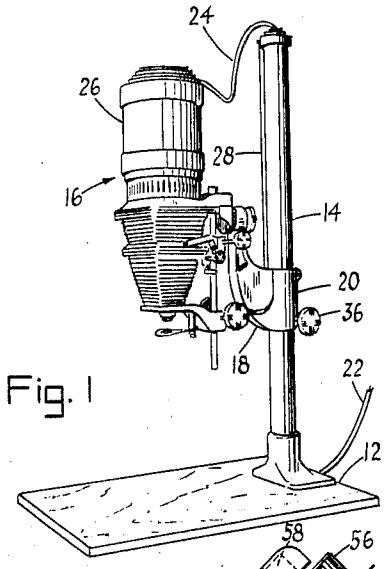


Fig. 1

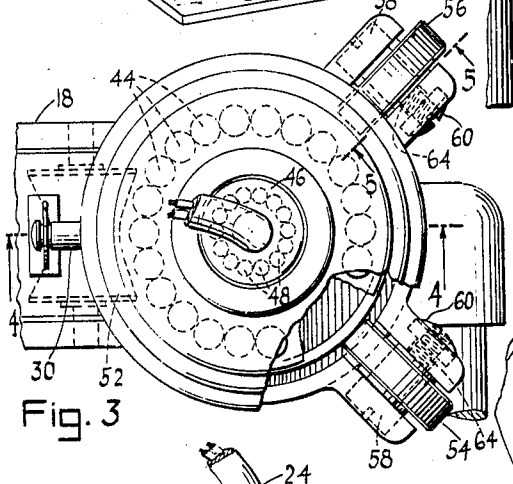


Fig. 3

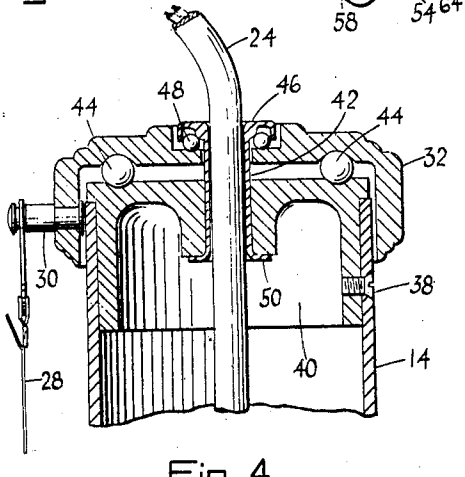


Fig. 4

Fig. 2

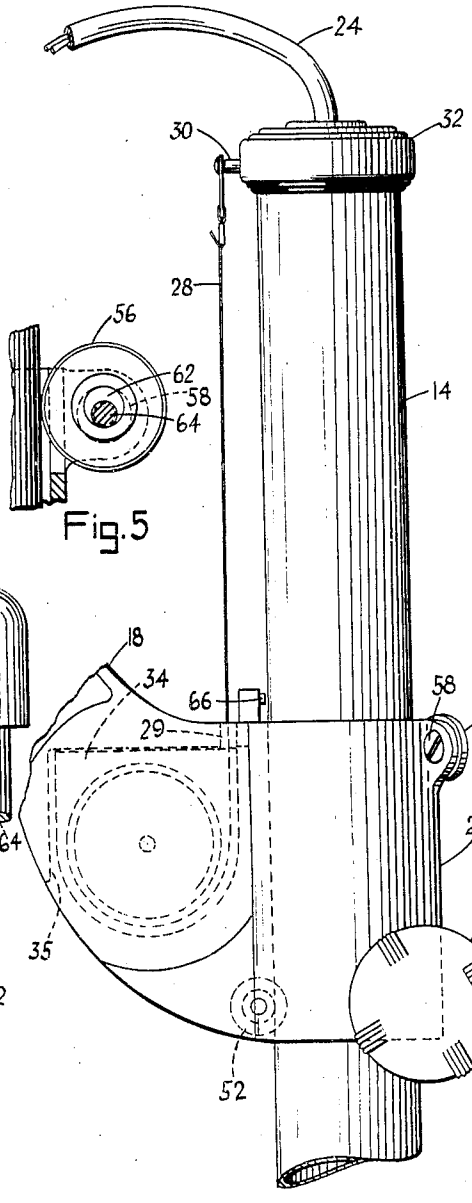


Fig. 5

INVENTOR

ANTHON A. LEONARD

BY James and Franklin

ATTORNEYS

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PHOTOGRAPHIC ENLARGER

Anthon A. Leonard, Glenside, Pa., assignor to De Jur-Amsco Corporation, Shelton, Conn., a corporation of New York

Application February 12, 1941, Serial No. 378,493

12 Claims. (Cl. 248—124)

This invention relates to photographic apparatus, and more particularly to enlargers.

The primary object of my invention is to generally improve enlargers of the vertical column type. More particular objects are to provide for accurate counterbalance of the weight of the vertically moving head; to guard against variation in counterbalance when the head is swung about the column; to insure ease of movement of the head about the column; and to guard against any tendency for the head to be drawn back from a desired outwardly rotated position by the pull on the counterbalance means. Another object is to avoid or minimize wear on the electric supply cord leading to the lamp house. A still further object is to provide simplified means for adjusting the head in two directions for parallelism with the column.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, my invention consists in the enlarger elements and their relation one to the other, as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by a drawing, in which:

Fig. 1 is a perspective view showing an enlarger embodying features of my invention;

Fig. 2 is a side elevation showing a part of the column and the support arm for the head;

Fig. 3 is a partially sectioned plan view of the top of the column;

Fig. 4 is a section taken in the plane of the line 4—4 of Fig. 3; and

Fig. 5 is a section taken in the plane of the line 5—5 of Fig. 3.

Referring to the drawing, and more particularly to Fig. 1, the enlarger is conventional in comprising a base 12 having a tubular column 14 rigidly mounted thereon. The enlarger head generally designated 16 is carried on a support arm 18 having a collar 20 which is slidable and rotatable on column 14. An electric supply cord 22 extends upwardly through column 14, and has a flexible portion 24 which extends from the top of the column to the lamp house 26. The weight of the enlarger head is counterbalanced by means of a counterbalance tape or cord 28. The flexible cord 28 extends between the arm 18 and cap 32, and for reasons later explained, is under such tension in the present case as to only partially counterbalance the weight of the head, there being at least some residuary downward force on the arm 18.

Referring now to Fig. 2, the counterbalance tape 28 has its upper end connected to a pin 30 rigidly mounted on a post cap 32. The lower end of tape 28 runs into a conventional spring balance unit, the housing of which is indicated at 34. This unit is received within and sealed by the support arm 18. It comprises a drum on which the tape is wound and within which is carried a spring the action of which tends to wind up the tape. The spring action is properly selected to nearly counterbalance the weight of the enlarger head and its support arm. This is to facilitate vertical movement of the head, and after the head has been adjusted to desired position, it may be locked in that position by rotation of a suitable locking knob 36.

As so far described, the arrangement is conventional, but I have found that difficulty arises when the head is swung or rotated about the column to an offset position. Such movement biases the counterbalance tape 28. The counterbalance force and the desired smooth action when raising or lowering the head may be interfered with.

In accordance with the present invention, this difficulty is overcome by mounting the cap 32 rotatably on column 14, and providing the same with anti-friction bearings so that the cap will rotate readily with the enlarger head despite the downward pull on the cap.

Referring to Figs. 3 and 4, I provide a cap assembly which may be handled as a unit, and which may be inserted in the upper end of column 14 and there secured, if desired, by one or more screws 38. This cap assembly comprises an inner bearing 40, the rotatable cap 32, and a sleeve 42. The upper surface of inner bearing 40 and the lower surface of cap 32 are matingly recessed to form a race-way for a series of bearing balls 44. It will be noted that these are disposed on a large diameter. The upper end of sleeve 42 is provided with a head 46, and a ring of similar bearing balls 48 is provided between the head 46 and the recessed top surface of cap 32. Sleeve 42 passes through the inner bearing 40, and is flanged or spun outwardly at 50, thus holding the cap assembly in assembled relation and preventing accidental loss of the bearing balls. The riveting of sleeve 42 prevents rotation of the same, and this is desirable in that the electric supply cord 24 passes through sleeve 42. Wear is minimized because no relative movement or rotation takes place between the cord and the sleeve, the movement of the enlarger head being accommodated by the flexibility of the cord leading thereto.

The arm 18 is hollowed from the bottom upwardly at 35 to receive the balance housing 34, the latter being held in position solely by the tension or upward pull of tape 28 passing through opening 29.

The collar 20 of support arm 18 is provided with a spool-like guide drum or wheel 52 (Figs. 2 and 3) at the lower end of the collar. It is also provided at its upper end with two guide wheels 54 and 56 (Figs. 2 and 3). The axes of

guide wheels 54 and 56 are arranged mutually at right angles, and both axes are perpendicular to the column. Each of these wheels is preferably adjustable toward or away from the column. Specifically, the wheels are freely rotatable on eccentrically mounted bearings. The bearings are formed with slotted heads 58 for adjustment of the wheels, and the final adjustment may be locked by means of round slotted nuts 60 (Fig. 3). In Fig. 5 it will be seen that the guide wheel 56 is rotatable on a bearing 62 which is eccentrically related to the head 58 and to the threaded or screw portion 64 which receives the lock nuts (Fig. 3). The head 58 (Figs. 2 and 3) and the bearing as a whole, as well as the lock nut 60, are rotatable about the axis of the screw 64.

By using two adjustable or eccentrically mounted guide wheels located in the manner shown, the enlarger head may be adjusted to bring the same parallel to the column 14. This adjustment may be in the plane of the enlarger head and column, and also transversely of that plane. Only two adjustable wheels are needed, because they are located at the rear of collar 20, and the weight of the enlarger head in this design is such as to normally hold the support arm 18 downward, so that a total of three guide wheels 52, 54 and 56 are adequate for support purposes. In other words, the force of the spring balance is kept less than the weight of the enlarger head, when using this particular arrangement of guide wheels.

A small stop 66 may be provided at the top of the collar 20 in order to limit upward movement of the support arm 18, should it be turned upwardly for any reason. It will be understood that the stop 66 is normally spaced a slight amount from the column 14, and does not offer any frictional resistance to movement. It does not enter into adjustment of the axis of the enlarger head. It merely takes care of the contingency of abnormal force on the support arm such as may take place during shipment or movement of the enlarger, or possible mishandling of the same.

It is believed that the construction and operation of my improved enlarger, as well as the advantages thereof, will be apparent from the foregoing detailed description thereof. The rotatable cap keeps the spring balance tape automatically aligned at all times with the enlarger head. The balance force is constant, and remains vertical. The enlarger head may be adjusted for parallelism in either of two directions, while using only two adjustable guide wheels, these preferably being eccentrically mounted for adjustment.

It will be apparent that while I have shown and described my invention in a preferred form, many changes and modifications may be made in the structure disclosed, without departing from the spirit of the invention as sought to be defined in the following claims.

I claim:

1. Supporting structure for an enlarger head, said supporting structure comprising a base, a cylindrical column extending upwardly from said base, a support arm for said head movable axially and rotatably on said column, balance means for counterbalancing the weight of the head, said balance means including a flexible cord extending between said support arm and a cap at the top of said column, said cap being arranged concentrically with said column and having a horizontal wall over the upper end of the column, a stationary inner bearing fixedly inserted in the upper end of the column and having a horizontal top wall, mating ball bearing raceways formed in the bottom of the horizontal wall of the cap, and on the top of the horizontal wall of the inner bearing, the diameter of said raceways being substantial and being nearly as large as that of the column, and a race of balls disposed between said raceways.

2. Supporting structure for an enlarger head, said supporting structure comprising a base, a tubular column extending upwardly from said base, a support arm for said head movable axially and rotatably on said column, a spring balance for counterbalancing the weight of the head, said spring balance including a spring housed in said support arm and a tape extending upwardly from said spring to the top of said column, and means at the top of said column to hold said tape, said means including a cap arranged concentrically with said column and having a horizontal wall over the upper end of the column, a stationary inner bearing fixedly inserted in the upper end of the column and having a horizontal top wall, mating ball bearing raceways formed in the bottom of the horizontal wall of the cap, and on the top of the horizontal wall of the inner bearing, the diameter of said raceways being substantial and being nearly as large as that of the column, and a race of balls disposed between said raceways.

3. Supporting structure for an enlarger head, said supporting structure comprising a base, a tubular column extending upwardly from said base, a support arm for said head movable axially and rotatably on said column, balance means for counterbalancing the weight of the head, said balance means including a flexible cord extending between said support arm and a cap at the top of said column, said cap being freely rotatable, an electric supply cord extending from said base upwardly through said column and from the top of the column to said enlarger head, and a sleeve surrounding said cord at the aforesaid rotatable cap and secured to said column in order to prevent separation of the cap from the top of the column.

4. Supporting structure for an enlarger head, said supporting structure comprising a base, a tubular column extending upwardly from said base, a support arm for said head movable axially and rotatably on said column, a spring balance for counterbalancing the weight of the head, said spring balance including a spring carried in said support arm and a tape extending upwardly from said spring to the top of said column, means at the top of said column to hold said tape, said means including a cap arranged concentrically with said column and rotatable on ball bearings disposed beneath the cap to take a downward thrust, an electric supply cord extending from said base upwardly through said column and from the top of the column to said enlarger head, and a tubular sleeve surrounding said cord at the aforesaid rotatable cap, said sleeve holding said cap against separation from said ball bearings.

5. Supporting structure for an enlarger head, said supporting structure comprising a base, a cylindrical column extending upwardly from said base, a support arm for said head movable axially and rotatably on said column, balance means for counterbalancing the weight of the head, said balance means including a flexible cord extending between said support and a cap assembly at

the top of said column, said cap assembly comprising a non-rotatable inner bearing fixed at the top of the column and having a horizontal top wall, a rotatable cap disposed over said inner bearing and having a horizontal bottom wall, mating ball bearing raceways formed on the bottom of the horizontal wall of the cap and on the top of the horizontal wall of the inner bearing, the diameter of said raceways being substantial and being nearly as large as that of the column, a race of balls between said inner bearing and cap, and means to hold said cap and inner bearing against separation.

6. Supporting structure for an enlarger head, said supporting structure comprising a base, a tubular column extending upwardly from said base, a support arm for said head movable axially and rotatably on said column, a spring balance for counterbalancing the weight of the head, said spring balance including a spring carried in said support arm and a tape extending upwardly from said spring to the top of said column, means at the top of said column to hold said tape, said means comprising a non-rotatable inner bearing fixed in the top of the column and having a horizontal top wall, a rotatable cap disposed over said inner bearing and having a horizontal bottom wall, mating ball bearing raceways formed on the bottom of the horizontal wall of the cap and on the top of the horizontal wall of the inner bearing, the diameter of said raceways being substantial and being nearly as large as that of the column, a race of balls between said inner bearing and cap, a headed sleeve extending downwardly through the center of said cap and inner bearing, a race of balls between the head of the sleeve and the cap, said sleeve being non-rotatably secured to said inner bearing and functioning to hold the cap and inner bearing in assembled relation with the bearing balls therebetween.

7. Supporting structure for an enlarger head, said supporting structure comprising a base, a tubular column extending upwardly from said base, a support arm for said head movable axially and rotatably on said column, a spring balance for counterbalancing the weight of the head, said spring balance including a spring carried in said support arm and a tape extending upwardly from said spring to the top of said column, means at the top of said column to hold said tape, said means comprising a non-rotatable inner bearing fixed in the top of the column, a rotatable cap disposed over said inner bearing, a race of balls between said inner bearing and cap, a headed sleeve extending downwardly through said cap and inner bearing, a race of balls between the head of the sleeve and the cap, said sleeve being non-rotatably secured to said inner bearing and functioning to hold the cap and inner bearing in assembled relation with the bearing balls therebetween, and an electric supply cord extending from said base through said column and passing through said sleeve to the enlarger head.

8. Supporting structure for an enlarger head, said supporting structure comprising a base, a column extending upwardly from said base, an arm supporting said head and having a collar slidable on said column, a guide wheel near the bottom of said collar at the forward side, two guide wheels near the top of said collar at the rear side, said guide wheels having their axes approximately perpendicular, and adjustably mounted shafts for said guide wheels in order to afford adjustment of the head for parallelism to the column.

9. Supporting structure for an enlarger head, said supporting structure comprising a base, a column extending upwardly from said base, an arm supporting said head and having a collar slidable on said column, a guide wheel near the bottom of said collar at the forward side, two guide wheels near the top of said collar at the rear side, said guide wheels having their axes approximately perpendicular, and eccentrically mounted rotatably adjustable shafts for said guide wheels in order to afford adjustment of the head for parallelism to the column.

10. Supporting structure for an enlarger head, said supporting structure comprising a base, a column extending upwardly from said base, an arm supporting said head and having a collar slidable on said column, a guide wheel near the bottom of said collar at the forward side, two guide wheels near the top of said collar at the rear side, said guide wheels having their axes approximately perpendicular, eccentrically mounted rotatably adjustable shafts for said guide wheels in order to afford adjustment of the head for parallelism to the column, and balance means to counterbalance less than all of the weight of the enlarger head and support arm.

11. Supporting structure for an enlarger head, said supporting structure comprising a base, a column extending upwardly from said base, an arm supporting said head and having a collar slidable on said column, a guide wheel near the bottom of said collar at the forward side, two guide wheels near the top of said collar at the rear side, said guide wheels having their axes approximately perpendicular to one another and to the column, and eccentrically mounted rotatably adjustable shafts for said guide wheels in order to afford adjustment of the head for parallelism to the column, the top of said collar at the forward portion thereof being devoid of guide wheels but having a stop normally spaced from the column but adapted to limit permissible upward tilt of the arm.

12. Supporting structure for an enlarger head, said supporting structure comprising a base, a tubular column extending upwardly from said base, a support arm for said head movable axially and rotatably on said column, a spring balance for counterbalancing the weight of the head, said spring balance including a spring housed in said support arm and a tape extending upwardly from said spring to the top of said column, and means at the top of said column to hold said tape, said means including a cap arranged concentrically with said column and having a horizontal wall over the upper end of the column, a stationary inner bearing fixedly inserted in the upper end of the column and having a horizontal top wall, mating ball bearing raceways formed in the bottom of the horizontal wall of the cap, and on the top of the horizontal wall of the inner bearing, the diameter of said raceways being substantial and being nearly as large as that of the column, a race of balls disposed between said raceways, an electric supply cord extending from said base upwardly through said column and from the top of the column to said enlarger head, and a tubular sleeve surrounding said cord at the aforesaid rotatable cap, said sleeve holding said cap against axial separation from said inner bearing.

ANTHON A. LEONARD.