Sept. 12, 1961 H. HAUPTVOGEL ET AL 2,999,423

ELECTRIC DRIVES FOR PHOTOGRAPHIC ENLARGING AND REPRODUCING APPARATUS

Filed Sept. 6, 1957 2 Sheets-Sheet 1

FIG. 1

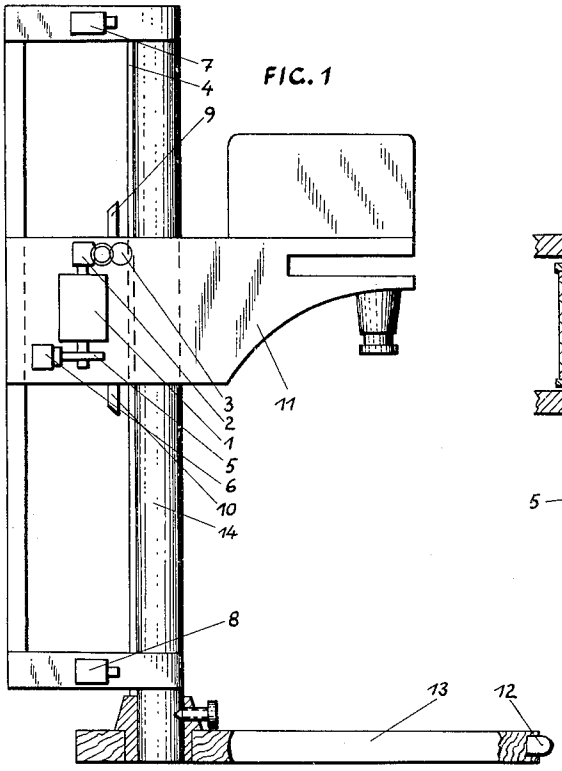
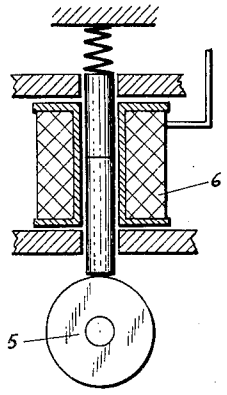


FIG. 2



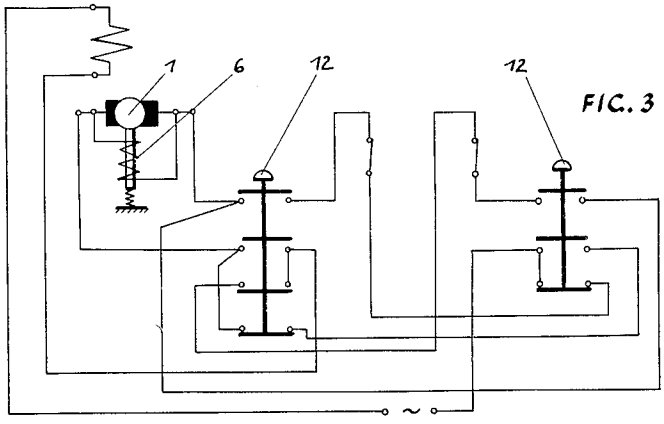


FIG. 3

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Sept. 12, 1961 H. HAUPTVOGEL ET AL 2,999,423

ELECTRIC DRIVES FOR PHOTOGRAPHIC ENLARGING AND REPRODUCING APPARATUS

Filed Sept. 6, 1957 2 Sheets-Sheet 2

FIG. 4

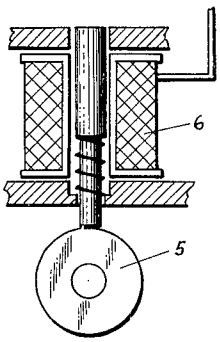


FIG. 5

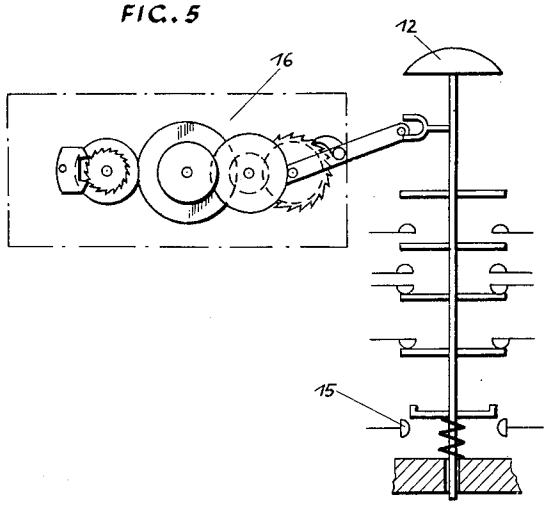
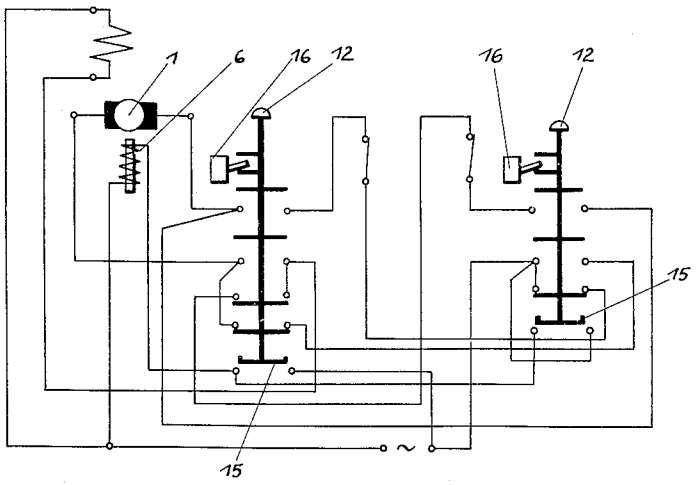


FIG. 6



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ELECTRIC DRIVES FOR PHOTOGRAPHIC ENLARGING AND REPRODUCING APPARATUS

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3 Claims. (Cl. 88—24)

This invention relates to photographic enlarging and reproducing or process-work apparatus and particularly to an electromotive drive for vertical and horizontal adjustment of the enlarging or reproducing system preferably arranged on a common support.

The use of electromotive drives for vertical and lateral adjustments in photographic enlarging and reproducing outfits provided with a stationary driving motor disposed as a rule on or under the base plate is known. The drive required for such adjustments is transmitted by a number of structural members, as shafts, chains, bevel gears, worms and other transmission agents with which spindles, pull ropes, bevel gear wheels, friction rollers and the like are connected by means of which the units to be adjusted are finally moved. Frequently, a guide rod or column has to be additionally employed.

All known arrangements of this type are open to several objections. Their manufacture is rendered uneconomical as to time, material and weight due to the various transmission members required and their accommodation or mounting. The numerous intermediate transmission members even if of precision make have, furthermore, an unfavorable effect upon safety in operation and exact and quick reversal, particularly in case of short directional changes of units, so that a moved unit cannot be instantaneously started and stopped. Owing to increased friction and the necessity of overcoming pulling and compression stresses of spindles, ropes, racks or other adjusting means a relatively strong driving motor is needed which increases the total weight of the apparatus still more. The known electromotive drives of enlarging systems for which the drive according to the invention is preferably used suffer also from the drawback that the enlarging system cannot be turned 180° for producing large size pictures outside the base plate without considerable structural alteration involving large expenditures.

It is the object of the invention to provide an electromotive drive which eliminates these defects of the known types.

This object is attained by employing as electric drive a fractional horse-power motor which is not stationary but including its mechanism is directly attached to or mounted on the vertically or horizontally movable support of the enlarging or reproducing system and thus participates in every adjusting motion of the support.

Compared with the known electromotive drives the drive according to the invention, due to the movable arrangement of the motor, permits direct transmission of drive without the use of the numerous transmission elements hitherto required. The manufacture is thereby considerably simplified and production cost reduced while safety and reliability in operation are increased. As fractional horse-power motors have practically without exception high speed ranges, they can be greatly reduced in simple manner so that the driving power of a fractional horse-power motor is entirely sufficient for adjusting enlarging and reproducing systems whenever necessary. Furthermore, fractional horse-power motors can be rapidly braked and stopped and also started within a short time owing to which directional changes can be exactly controlled even at short distance adjustments.

The fractional horse-power motor may be additionally

coupled with a preferably electromagnetically acting braking device and so controlled that the latter becomes effective as soon as the motor is switched off. The electromagnetic brake may for instance be so constructed that it non-positively, as by spring pressure, acts on the gear when the motor has been or is being switched off and when the motor is switched on again is simultaneously raised out of braking position. According to another inventive idea the electromagnetic braking device may be constructed in such a way that it becomes effective only at the moment when the motor is switched off. This can be attained by activating a sliding contact operating with a retarder at disengagement of the motor and during its contact action closing the circuit for the electromagnetic braking device which is released again after retardation. In this way, while instantaneous braking is effected when the motor is switched off, the electromagnetic braking device is prevented from constantly carrying current.

An electric drive formed as described reliably ensures instantaneous stoppage of the moving enlarging or reproducing system at the desired adjusted position. In addition, at the end of the horizontal or vertical guide elements may be provided which automatically switch off the electric drive when these end positions are reached whereby also seizing and gear troubles connected therewith are avoided at these positions.

The employment of fractional horse-power motors affords also the advantage of a corresponding reduction of the total weight of the apparatus, and the drive according to the invention permits furthermore to turn the enlarging or reproducing system 180°.

One embodiment of the invention applied to a photographic enlarging unit is illustrated in the accompanying drawings, wherein

FIGURE 1 is a diagrammatic layout of the drive of an enlarging unit;

FIG. 2 shows an example of an electromagnetic braking device using a brake magnet;

FIG. 3, a corresponding wiring diagram;

FIGS. 4 and 5 show an example of construction of an electromagnetic braking device with a lifting magnet; and

FIG. 6 shows a corresponding wiring diagram.

The diagrammatic layout shown in FIG. 1 comprises a fractional horse-power motor **1**, a reduction system **2** suitably consisting of a worm and worm wheel, a driving wheel **3**, a rack **4** for driving wheel **3**, a motor brake disk **5**, a motor brake **6**, an upper cut-out **7**, a lower cut-out **8**, an upper control pin **9** for cut-out **7**, a lower control pin **10** for cut-out **8**, a support **11** of the enlarging system with which the gear is connected, **12** is one of the two push-button switches disposed on the front surface of the base plate **13**, and **14** is the guide column of the enlarging outfit.

The mode of operation is as follows:

When one or the other switch **12** is operated, the fractional horse-power motor **1** provided on the support **11** of the enlarging system commences to run and over driving gear **2**, **3** and rack **4** moves the support **11** with the enlarging system along the guide column **14** up or down in vertical direction depending on which one of the two switches **12** has been actuated. Before the uppermost adjustment has been reached, the control pin **9** strikes against the cut-out **7** and, inversely, control pin **10** strikes against cut-out **8** before the lowest end position has been reached. In these end positions the current is switched off by the cut-outs **7**, **8** so that sticking of the support **11** in these positions is not possible.

When the electric drive is switched off in these or in other adjusted positions, the fractional horse-power motor **1** is simultaneously braked if the drive is fitted with an

electromagnetic braking device according to FIGS. 2–6, which operates as follows:

With respect to the braking device shown in FIGS. 2 and 3 braking is effected by the electromagnet **6** whose core is pressed by spring action upon the motor disk **5**, and this braking effect continues until the circuit is interrupted or the motor switched off. During switching on of the motor the electromagnet **6** receives simultaneously current and thereby moves the brake core out of braking position against the pressure of the spring.

In the braking arrangement according to FIGS. 4–6 the circuit of the electromagnet **6** remains interrupted as long as the motor runs. When the latter is switched off, the slide contact **15** connected with electromagnet **6** is activated, whereby the motor disk **5** is braked via the core of the magnet. The duration of this braking effect is delayed by a retarding device **16** in engagement with switch **12** until at the return motion of switch **12** the slide contact **15** is interrupted again.

Compared with known drives, the drive according to the invention is distinguished by its rapid and unfailing reaction to an adjustment made by simple push-button switches and to a reversal of motion of a unit in both directions even over shortest distances.

We claim:

1. An enlarging apparatus comprising a stationary base plate, a guiding column supported by and substantially perpendicular to said base plate, a rack attached to and extending along the major portion of said guiding column, a movable carriage member on said guiding column along which it can be reciprocated, an optical projection unit on said carriage member, electric drive means secured to said carriage member, a gear driven by said drive means and engaging said rack for reciprocating said carriage member, a source of electric power, control means for energizing said drive means from said source of power, and limit switch means comprising a cut-out switch attached adjacent each end of said rack and an abutment at either side of said carriage member, said abutments being adapted to operate said cut-out switches in the extreme positions of said carriage member so as to de-energize said drive means to bring said carriage member to a stop.

2. An enlarging apparatus according to claim 1 wherein said guiding column can be swiveled by about 180 degrees along its axis together with said carriage member, said electric drive means and said optical projection unit movable thereon.

3. An enlarging apparatus comprising a stationary base plate, a guiding column supported by and substantially perpendicular to said base plate, a rack attached to said guiding column, a movable carriage member reciprocable along said guiding column, an optical projection unit on said carriage member, electric drive means secured to said carriage member and engaging said rack for reciprocating said carriage member with respect to said rack, electromagnetic brake means on said carriage member for normally impeding the movement of said drive means when de-energized and when energized allowing free movement of said drive means, a source of electric power, and control means for simultaneously energizing said drive means and said brake means from said source of power, said brake means engaging said drive means only in its de-energized condition.

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