March 1, 1966 F. S. SIOK 3,237,736

PHOTOGRAPHIC CONTACT PRINTER APPARATUS

Filed Jan. 9, 1964

3 Sheets-Sheet 1

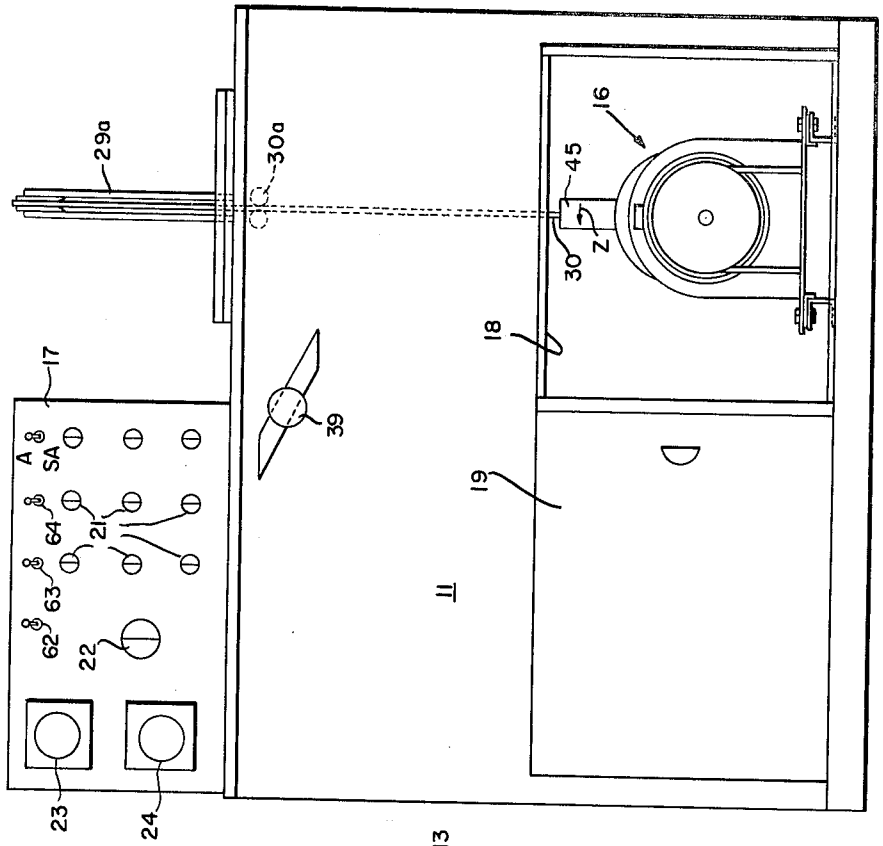


FIG. 2.

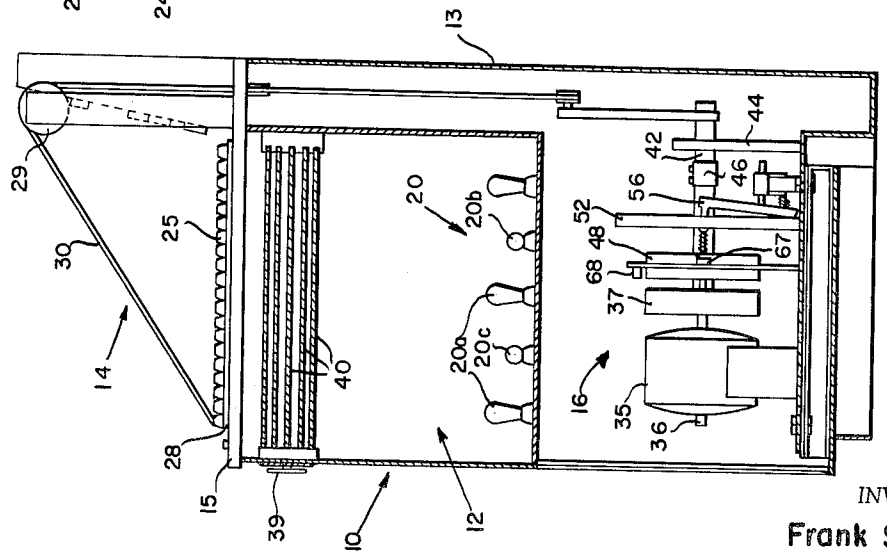


FIG. 1.

INVENTOR

Frank S. Siok

BY

ATTORNEY

March 1, 1966 F. S. SIOK 3,237,736

PHOTOGRAPHIC CONTACT PRINTER APPARATUS

Filed Jan. 9, 1964 3 Sheets-Sheet 2

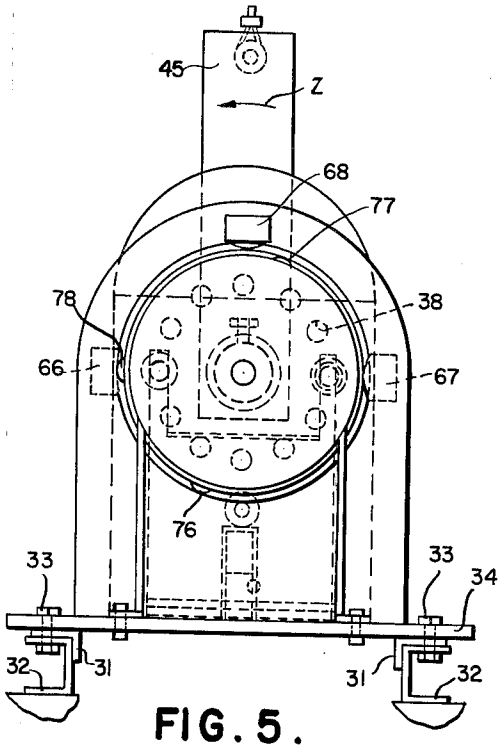


FIG. 5.

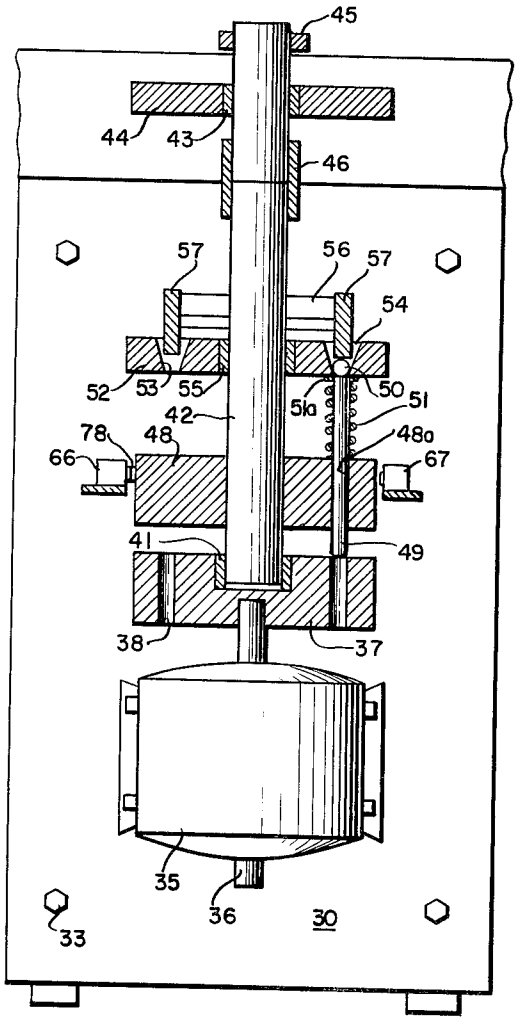


FIG. 3.

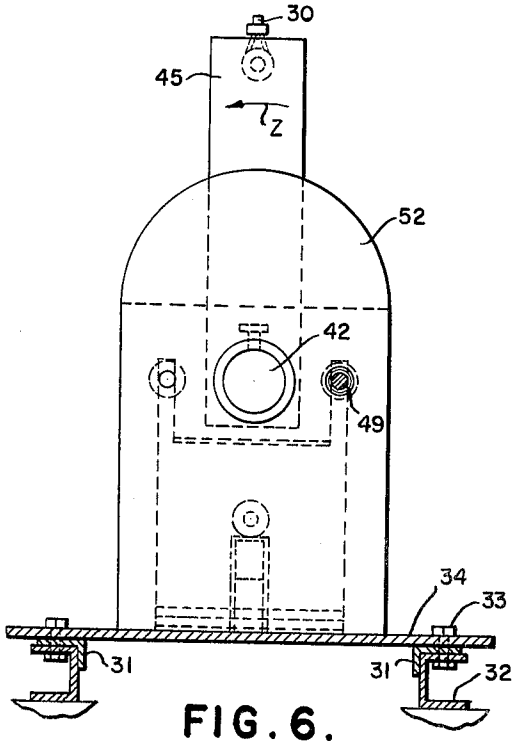


FIG. 6.

INVENTOR
Frank S. Siok

BY H. B. Wilson & Co.
ATTORNEY

March 1, 1966 F. S. SIOK 3,237,736

PHOTOGRAPHIC CONTACT PRINTER APPARATUS

Filed Jan. 9, 1964

3 Sheets-Sheet 3

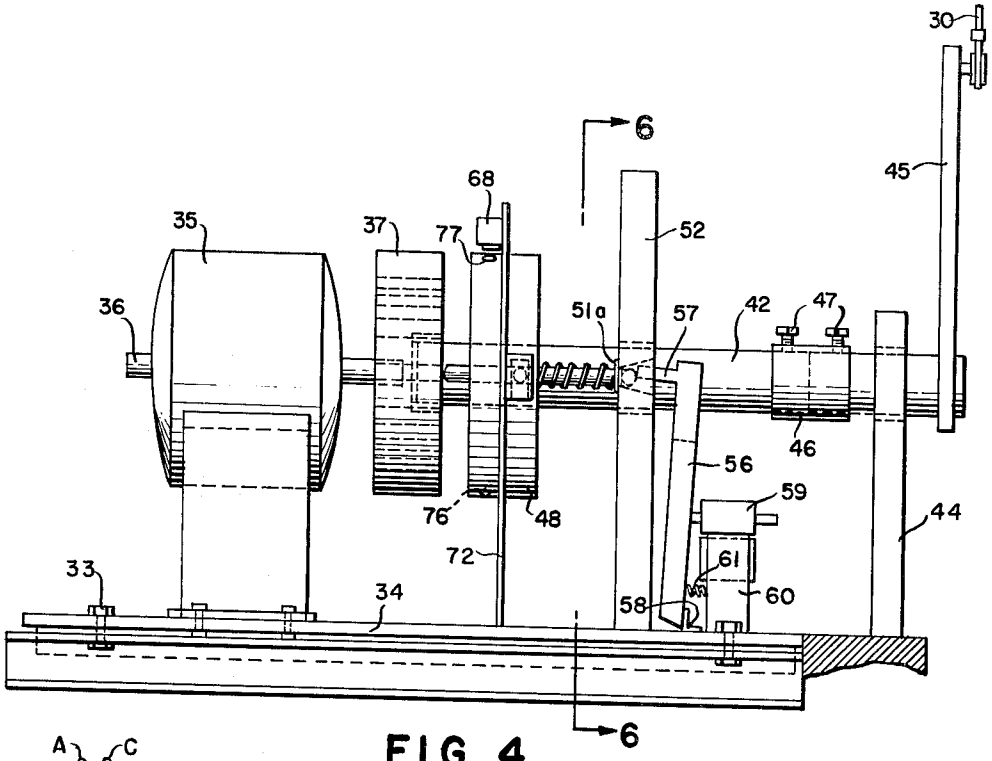


FIG. 4.

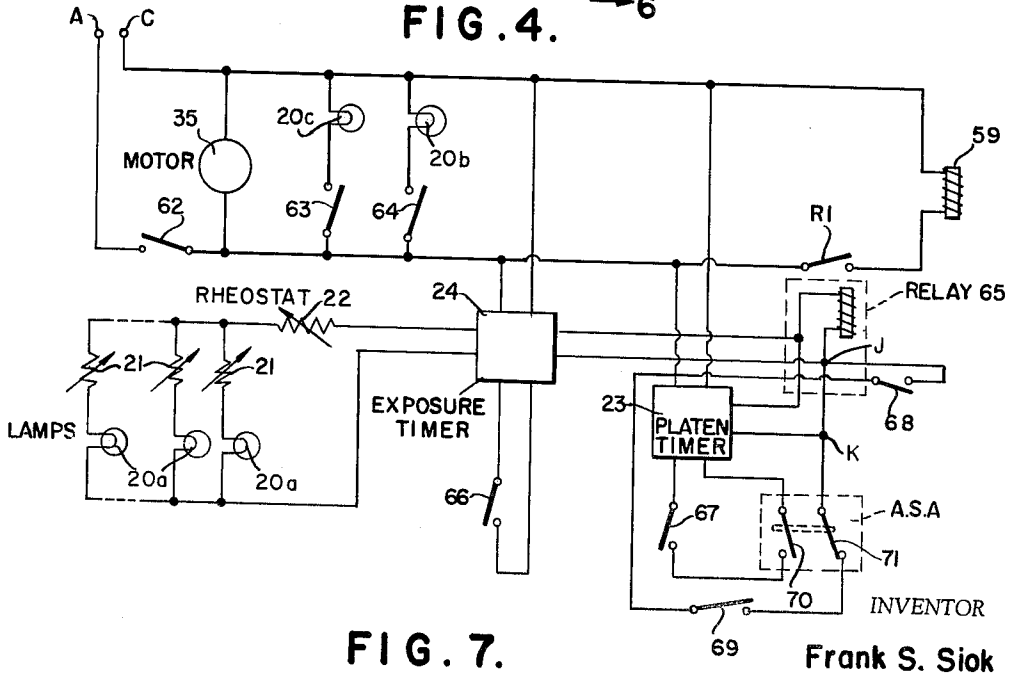


FIG. 7.

INVENTOR

Frank S. Siok

BY H. B. Wilson & Co.

ATTORNEY

United States Patent Office 3,237,736 Patented Mar. 1, 1966

3,237,736

PHOTOGRAPHIC CONTACT PRINTER APPARATUS

Frank S. Siok, 2935 N. Harding Ave., Chicago, Ill.

Filed Jan. 9, 1964, Ser. No. 336,658
4 Claims. (Cl. 192—67)

The present invention relates generally to the photographic art, and, more particularly, to an improvement in a photographic contact printer which provides for selective automatic or semi-automatic operation.

Photographic contact printer apparatuses have been known in this art using motor-driven timing mechanisms for raising and lowering the platen. Such mechanisms have been difficult to repair and to adjust and frequently the automatic or semi-automatic mechanism was permanently mounted into the machine so that it was impossible to remove it for ease of repair or adjustment. These machines have not been very reliable and in many cases when they break down the operator must call a serviceman to repair them since they are rather complicated and can not be repaired by the operator himself. In many instances the operator is left without a printer to use until the serviceman arrives and repairs the machine. Frequently this waiting period is long and the down time of the machine results in a loss of money to the operator. Accordingly, some operators keep a second printer on hand for such emergencies and it is rather costly to have two printers on hand when actually one is all that is needed for the amount of work which may be performed in the studio. Furthermore, the cost of such repairs on automatic printers is quite high.

With these defects of the prior art in mind, it is a main object of the present invention to provide an improvement in automatic-semiautomatic contact printers which is very reliable in operation and sturdy in construction.

Another object of this invention is to provide an apparatus of the character described which is simple to operate.

A further object of the invention is to provide an improvement in printers which is structurally simple so that the operator himself can make any repairs which are needed.

Still another object is to provide an improvement in printers of the character described wherein the control and drive mechanism is mounted as a unit for easy removal from the machine for ease of repair or replacement.

Still a further object of the invention is to provide an improvement in printer devices wherein the device may be used either automatically or semi-automatically and switched from one to the other in a rather simple manner.

These objects and others ancillary thereto are accomplished in accordance with preferred embodiments of the invention wherein the printer device is provided with the usual platen which moves up and down as well as with an exposure box which contains suitable lights for exposing the negatives. The entire control mechanism is mounted as a unit on slides within the machine so that it can be slidingly removed from the machine housing with merely the necessity for disconnecting the connection between the control assembly and the platen and for unfastening the means which secure the control unit to the machine frame.

The control unit includes a crank or counter-balance arm which is connected through suitable means to the platen so that as the arm rotates it moves the platen up and down. This arm is fixed to a shaft which is connected to one side of a one-half a revolution clutch. The other side of this one-half a revolution clutch is mounted to

a motor shaft and is placed into continuous rotation. Thus, when desired, the clutch is engaged and one half a turn is made to either raise the platen or to lower it. Then, after a suitable period of time the clutch is again engaged and another one-half turn is made so as to lower or raise the platen, respectively.

The half-revolution clutch includes a constantly rotating drive wheel having a plurality of openings formed in the clutch-facing surface thereof. Fixedly mounted to the shaft on which the crank arm is mounted is a locking pin wheel in which a locking pin is slidably mounted and spring means urges this locking pin out of engagement with the drive wheel. The locking pin is normally disposed in a stationary locking pin plate and the spring means biasses the pin into this plate which is provided with two openings on the clutch-facing surface thereof and which are 180° apart. A locking pin arm having two projections which extend toward the openings in the locking pin plate is pivotally mounted so that when actuated the pins thereof engage the openings and push the locking pin against its spring means out of the openings of the locking pin plate and toward the openings in the locking pin wheel. When the locking pin engages one of the openings of the drive wheel, the locking pin wheel is then, by means of the locking pin, connected to the drive wheel so that the clutch is engaged and rotation takes place. The spring means of the locking pin urges the locking pin out of engagement with the drive wheel but since the end of the locking pin engages a solid surface engagement continues until the locking pin arrives at the point where the second opening is provided in the locking pin plate which is 180° spaced from the first opening. At this point the spring means disengages the locking pin and the clutch has thus made one half a revolution.

A suitable control circuit is provided which includes timers for timing the amount of time that the platen is down and also the amount of time that the platen is up as well as the exposure time and various relays which provide for both automatic and semi-automatic operation.

Additional objects and advantages of the present invention will become apparent upon consideration of the following description when taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a transverse sectional view taken through the device of the present invention.

FIGURE 2 is a front elevational view of the present invention.

FIGURE 3 is an enlarged horizontal view, partially in section, of the control device comprising the present invention.

FIGURE 4 is a side elevational view of the control and drive device illustrated in FIGURE 3.

FIGURE 5 is a left side view of FIGURE 4.

FIGURE 6 is a vertical sectional view taken substantially along the plane defined by reference line **6—6** of FIGURE 4.

FIGURE 7 is a circuit diagram illustrating the control circuit for the present invention.

With more particular reference to the drawings, a housing **10** is provided in which an exposure box **12** is located, and directly above the exposure box is a platen assembly **14**. The platen assembly is controlled by means of a control and drive unit **16** which is mounted at the bottom of housing **10**. The housing is of rectangular shape and may be supported directly upon a floor. It includes a front wall **11**, a rear wall **13**, and a top **15**. A control panel **17** projects upwardly from above the rear wall **13** and to one side of the platen apparatus **14** as shown more particularly in FIGURE 2. The front wall **11** is provided with an opening **18** in which a sliding door **19** is

fitted so that the door may be opened for access to the control unit **16**.

The top **15** is provided with a clear glass or a ground glass plate disposed directly above the exposure box **12** in order to support the negative and the sensitized paper. Disposed directly below the glass plate and at the bottom of exposure box **12** is a light source **20**. This light source may include a bank of dodging lamps **20***a* which may be controlled by a bank of dodging rheostats **21** mounted on the control panel **17**. A main rheostat **22** for controlling these lamps is also mounted on the control panel. A safety light **20***b* and a viewing light **20***c* are also included in the bank of lights. Also mounted on the control panel **17** is a platen timer **23** and an exposure timer **24**, the functions of which will be described in further detail below.

The negative and sensitized paper are pressed against the glass plate by means of a flexible platen **25** which is a part of the platen assembly **14**. This is a flexible platen which may be hinged to the top **15** at the rear end thereof and may comprise resilient strips connected by spaced bars and carrying a sponge rubber pad **28**. A platen pulley **29** is mounted above the rearward portion of the top **15** on brackets **29***a*. A rope or wire **30** is connected to the front end of platen **25**, passes over pulley **29** and then downwardly through an opening provided in the rearward end of top **15** and between aligning rollers **30***a* and then downwardly and is at the bottom end thereof connected to the control unit **16**.

A plurality of horizontal slides **40** are mounted within the exposure box **12** and each of these carries a filter or screen. The slides are individually shiftable longitudinally of the casing to bring the filters into or out of vertical alignment with the light source **20** and the glass plate. Each slide **40** may be a rectangular sheet of metal or other substantially rigid material having an opening in or over which is suitably fastened the filter or screen. The filter slides **40** are selectively operated by a single rotatable operating element **39** which is shiftable to coact with any one of a number of rack and pinion actuating mechanisms for moving the slides. All of this and the above-mentioned structure is similar to the structure which is disclosed in my U.S. Patent No. 2,721,507.

With more particular reference now to the details of the control unit **16**, it should be noted that this unit is mounted upon a rigid base plate **34**. This base plate **34** has slide members in the form of angle irons **31** mounted thereto with the flanges depending downwardly therefrom. These angle irons are themselves mounted onto U-shaped channel members **32** which are connected to the frame of the housing **10**. Nut and bolt arrangements **33** are used to secure the base plate **34** and angle irons **31** to the channel or U-shaped members **32** for rigidly securing the control unit **16** in place. However, it is evident that removing the nut and bolt arrangements **33** will allow the control unit **16** to be slid along the channel members **32** for easy removal thereof through the opening **18** provided in front wall **11** of housing **10**.

A motor **35** is mounted to base **34** and a motor shaft **36** is rotated thereby. A drive wheel **37** is connected to motor shaft **36** and rotates therewith. A plurality of openings **38** are formed through drive wheel **37** and these openings are arranged in circular fashion as may be seen from FIGURE 5. The side of drive wheel **37** opposite the motor shaft **36** is provided with an opening in which a bearing **41** is provided. A driven or clutch shaft **42** has one end thereof disposed in bearing **41** so that the clutch shaft **42** may rotate independently of drive wheel **37**. Near the other end of the clutch shaft is a bearing **43** mounted in a bearing support **44** so that the clutch shaft **42** is rotatably mounted. It may be noted that clutch shaft **42** is constructed in two sections which are held together by a splicing sleeve **46** which covers the adjoining or abutting ends of the sleeves and which includes set screws **47** which may be tightened down to hold the shafts rigidly together. If desired, flats may be provided on the portions of the shaft sections which underlie the set screws **47** to assure that there will be proper and rigid locking together of the shaft sections.

A locking pin wheel **48** is fixedly mounted to clutch shaft **42** for rotation therewith. This locking pin wheel is provided with an opening **48***a* therethrough in which an elongate locking pin **49** is disposed. This locking pin is solid throughout most of its length except for the end thereof which faces away from motor **35**. This end is hollow and a ball or ball bearing **50** is rotatably seated therein. A spring **51** constantly biasses the locking pin **49** away from the drive wheel **37**. This is accomplished by having one end of spring **51** engage the locking pin wheel **48** and the other end of this spring engaging a collar **51***a* fixed to the locking pin **49** so that the compression of the spring will bias it away from drive wheel **37**.

A locking pin plate **52** is disposed on the ball side of the locking pin **49** and is provided with openings **53** and **54** which are horizontally aligned and spaced 180° apart one on each side of the clutch shaft **42**. A bearing **55** is provided within this plate and this bearing also supports the clutch shaft **42** for rotation therein. A locking pin arm **56** provided with spaced and projecting release pins **57** is pivotally mounted at its lower end to a bracket **58** which is secured to the base plate **34**. The release pins **57** are so positioned that when the locking pin arm **56** is moved forwardly toward the locking pin, these release pins engage in the holes **53** and **54** and assure that the locking pin will be removed from the locking pin plate and pushed into one of the openings **38** in the drive wheel **37**.

A solenoid **59** is positioned to engage the arm **56** when the arm is in its retracted position and when the solenoid is not actuated, as shown in FIGURE 4. Solenoid **59** is supported on a mounting plate **60** and a return spring **61**, which is a tension spring, is connected between the arm **56** and the supporting plate **60**, so as to bias arm **56** into its retracted position, as shown in FIGURE 4.

With more particular reference now to FIGURE 7, the control circuit of the present invention is shown. The terminals A and C may be connected to a standard 110 volt A.C. 60-cycle source. The motor **35** is connected across these terminals and the motor is energized for constant rotation when the main switch **62** is manually closed. The above-mentioned safety and viewing lamps **20***b* and **20***c*, respectively, are shown connected across these terminals by switches **64** and **63**, respectively, which may be manually actuated to light these lamps. The solenoid **59** which is used to cause movement of arm **56** to, in turn, move the locking pin for engaging the clutch is also connected across the terminals A and C by means of a contact R1 which is controlled by a holding relay **65**.

A conventional exposure timer **24** is provided having a first pair of terminals connected across the power lines A and C, a second pair of terminals connected with opposite contacts of microswitch **66**, a third pair of terminals connected with the network including a series-connected main rheostat **22**, and a plurality of parallel branches each including a rheostat **21** connected in series with a lamp **20***a*, and a fourth pair of contacts connected with opposite ends of the coil of relay **65**.

Similarly, a conventional platen timer **23** is provided having a first pair of terminals connected across power lines A and C, a second pair of terminals connected in series with microswitch **67** and the switch contacts **70** of an automatic-semiautomatic switch, and a third pair of terminals also connected with opposite ends of the coil of relay **65**. Connected in parallel across junctions J and K of the conductor connecting the lower one of said third pair of terminals with one end of the relay coil is a series branch including a relay restoring microswitch

68, a manual platen timer switch 69, and the contacts 71 of the automatic-semiautomatic switch.

In connection with the electric control circuit for the control unit of the present invention, it should be noted that the locking pin wheel 48 is provided with a plurality of switch actuating wedges or cams 76, 77, and 78 and as may be seen from FIGURES 4 and 5, there are three of these, two of which, namely 76 and 77, are located on the forward circumferential portion of this wheel and the third of which, namely 78, is connected to the rearward circumferential portion of the wheel. A microswitch support 72 is provided on which the plurality of microswitches 66, 67, and 68, are mounted. The two microswitches 66 and 67 are in alignment with the path of cam 78 whereas the third microswitch 68 is aligned with the paths of cams 76 and 77.

Assuming that automatic operation of the device is desired, then the switch ASA must be moved from the position shown in FIGURE 7 toward the left so that the contact 71 is open and the contact 70 is closed. At the beginning of operation motor switch 62 is closed and the platen timer microswitch 67 is closed because the cam 78 is in engagement with this microswitch. In this position crank arm 45 points downwardly and the platen is up. At this time the platen timer 23 begins operation and during this time a negative and a sheet of sensitized paper can be inserted since the platen is maintained in its upper position. After a period of time, which may be set by adjusting the platen timer 23, the platen timer stops and in so stopping energizes relay 65 which closes contact R1 and energizes solenoid 59.

The energizing of solenoid 59 pushes arm 56, toward the left as viewed in FIGURE 4 which causes release pin 57 to move the locking pin 49 out of the opening in locking pin plate 52 and into engagement with one of the openings 38 in drive wheel 37. Thus, the clutch is engaged and the locking pin wheel 48 begins to rotate as does shaft 42 and crank 45 which, through rope 30 which had held the platen 25 in its upper position, causes the platen to begin lowering.

The cam 76 then hits microswitch 68 and relay 65 is released and thus solenoid 59 is de-energized. After one-half a turn the locking pin engages the other opening in plate 52 and the locking pin returns to the locking pin plate because of the bias of spring 51 so that the clutch is disengaged. The cam 78 then contacts microswitch 66 for the exposure timer and the exposure timing begins. After exposure for a suitable amount of time, which can be adjusted, the exposure timer stops and relay 65 which is connected to the exposure timer is energized by means of the exposure timer and thus contact R1 again closes and the solenoid 59 is again energized. As mentioned before, when the locking pin moves, the clutch is engaged and the wheel begins to rotate in the direction of arrow Z to begin raising movement of the platen 25.

Cam 77 then hits microswitch 68 and the relay 65 is released which releases the solenoid. After one half of a turn of the locking pin wheel 48, the locking pin returns to the locking pin plate and the clutch is then disengaged. At this time, the cam 78 hits the microswitch 67 and this starts the platen timer. This action continues until the device is shut off.

When the device is to be actuated semi-automatically, the switch ASA is moved into the position shown in FIGURE 7. When switch 62 is closed the motor 35 begins rotating continuously as does the motor wheel or drive wheel 37. It is assumed that the platen is in its upward position at this point and so after the negative and the sensitized paper are placed onto the clear glass above the exposure box 12, the manual platen timer switch 69 is closed so that the platen timer starts and the platen is maintained in its upper position. When the platen timer stops, this timer energizes relay 65 to energize the solenoid and thus cause engagement of the clutch. The action described above in connection with automatic operation then continues so that the exposure timer then comes into operation and controls the entire time of exposure at which time the platen is automatically raised so that the negative and the exposed sensitized paper can be removed. However, in this mode of operation it should be noted that the platen timer microswitch 67 is not operative and since the manual platen timer switch 69 is opened immediately upon its release, when the platen is again moved to its uppermost position the clutch is disengaged and further actuation of the device ceases until the switch 69 should again be closed.

It should be noted that a mechanical relay step type impulse ratchet relay can be used for the relay 65 so that although the manual switch 69 is closed only momentarily the relay 65 will remain energized. Also, motor 35 may be a ¼ horsepower 30 r.p.m. motor.

Thus, an apparatus is provided which can be used for production printing in which case the automatic mode would be used. If the operator has only a few prints to make, he may choose to run the apparatus in its semi-automaic mode. It should be noted that this relay 65 is a standard mechanical release relay which operates with the microswitch 68. The platen timer and the exposure timer can be model No. P–59 manufactured by Time-O-Lite Corporation. It should be noted that in the event a repair is necessary, the device is sufficiently simple that an operator may repair it himself or the entire control unit 16 may be removed and repaired while removed or in fact another unit may be used to replace the defective one. It should be clear that releasing the set screw 47 which engages the clutch shaft 42 and releasing the nut and bolt arrangements 33 will completely disconnect the control unit 16 from the device so that the unit may be slid out of the housing. Thus, the entire unit can be removed from the printer in just a few minutes and can be shipped very easily if need be for major services.

The positive acting locking pin provides for reliable operation and the ball bearing construction on the end of the locking pin eliminates wear and tear on the locking pin and on the locking pin plate. All of the disks and shafts and other parts of the entire unit can be constructed of heavy steel so as to eliminate breakdowns and reduce the cost of repairs. Also, all of the parts used including microswitches, the solenoids, the relay and even the motor are standard parts which can be purchased in any local shops handling this type of merchandise so that the operator can conveniently obtain spare parts.

It will be understood that the above description of the present invention is susceptible to various modifications, changes, and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

What is claimed is:

1. A clutch for driving a shaft a predetermined portion of a revolution, comprising, in combination:

a rotatable drive wheel having a plurality of openings formed in one side surface thereof in a circular arrangement;

a rotatable locking pin wheel facing said drive wheel;

a locking pin mounted for axial movement in said locking pin wheel to project a sufficient distance therefrom to engage one of the openings in said drive wheel;

a stationary locking pin plate having openings therein which are disposed in alignment with the path of movement of said locking pin;

spring means for biassing said locking pin toward said locking pin plate so that the locking pin is normally engaged in one of the openings in said locking pin plate;

means for moving said locking pin out of engagement with said plate and into engagement with said drive wheel; and

means for actuating said releasing means to move the

locking pin out of the particular opening in which it is engaged and into engagement with one of the openings in said drive wheel so that the locking pin wheel is rotated with said drive wheel until the locking pin comes into alignment with the other opening in the locking pin plate into which it is biassed by the spring means thus disengaging it from the drive wheel.

2. A one half a revolution clutch comprising, in combination:

a drive shaft having a drive wheel thereon which has a plurality of openings formed in one side surface thereof in a circular arrangement;

a driven shaft coaxial with said drive shaft and mounted for rotation;

a locking pin wheel fixed on said driven shaft and facing said drive wheel;

a locking pin rotatable with said locking pin wheel and mounted for axial movement in said locking pin wheel to project a sufficient distance therefrom to engage one of the openings in said drive wheel;

a stationary locking pin plate having a pair of 180° spaced openings therein disposed in alignment with the path of movement of said locking pin;

spring means for biassing said locking pin toward said locking pin plate so that the locking pin is normally engaged in one of the openings in said locking pin plate;

means for moving said locking pin out of engagement with said plate and into engagement with said drive wheel; and

means for actuating said releasing means to move the locking pin out of the particular opening in said plate in which it is engaged and into engagement with one of the openings in said drive wheel so that the locking pin wheel and thus the driven shaft is rotated with said drive shaft until the locking pin comes into alignment with the other opening in the locking pin plate into which it is biassed by the spring means thus disengaging it from the drive wheel.

3. A one half a revolution clutch device comprising, in combination:

a drive shaft having a drive wheel thereon which has a plurality of openings formed in one side surface thereof in a circular arrangement;

a driven shaft coaxial with said drive shaft and mounted for rotation and having one end thereof rotatably journalled in said drive wheel;

a locking pin wheel fixed on said driven shaft and facing said drive wheel;

a locking pin rotatable with said locking pin wheel and mounted for axial movement in said locking pin wheel to project a sufficient distance therefrom to engage one of the openings in said drive wheel;

a stationary locking pin plate in which said driven shaft is journalled and having a pair of openings therein in horizontal alignment with the driven shaft, said openings being disposed in alignment with the path of movement of said locking pin;

a spring for biassing said locking pin toward said locking pin plate so that the locking pin is normally engaged in one of the openings in said locking pin plate;

a locking pin release arm adjacent said plate and on the opposite side thereof from said locking pin wheel, said arm having release pins disposed in alignment with the openings in said locking pin plate; and

means for moving said locking pin release arm to move said release pins toward and into the openings in said locking pin plate to force the locking pin out of the particular opening in said plate in which it is engaged and into engagement with one of the openings in said drive wheel so that the locking pin wheel and thus the driven shaft is rotated with said drive shaft until the locking pin comes into alignment with the other opening in the locking pin plate into which it is biassed by the spring thus disengaging it from the drive wheel.

4. A device as defined in claim 3 comprising a motor for driving said drive shaft, and a single base plate on which all of said elements are mounted whereby a single unit is formed.

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JULIA E. COINER, *Primary Examiner.*

EVON C. BLUNK, *Examiner.*