Jan. 14, 1964 K. M. OLIPHANT 3,117,501

CHARGING AND/OR PRINTING UNIT FOR ELECTROPHOTOGRAPHIC PROCESSES

Filed Aug. 30, 1960 2 Sheets-Sheet 1

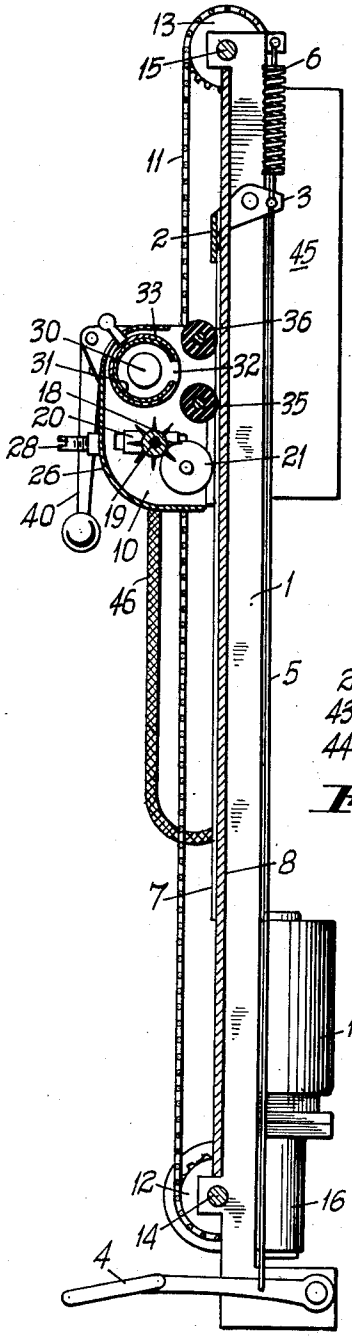

FIG. 1

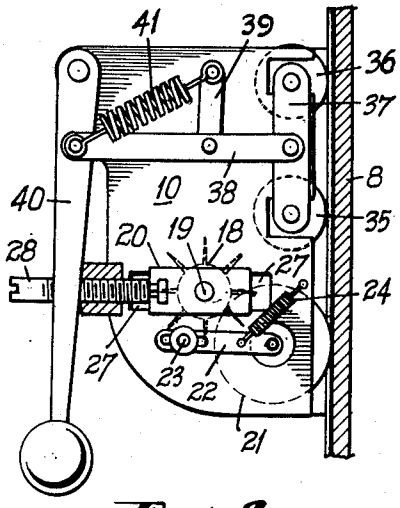

FIG. 3

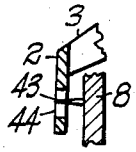

FIG. 4

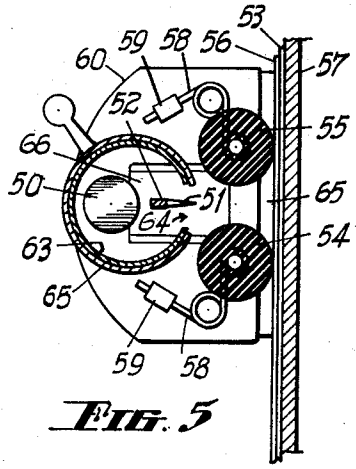

FIG. 5

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CHARGING AND/OR PRINTING UNIT FOR ELECTROPHOTOGRAPHIC PROCESSES

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2 Sheets-Sheet 2

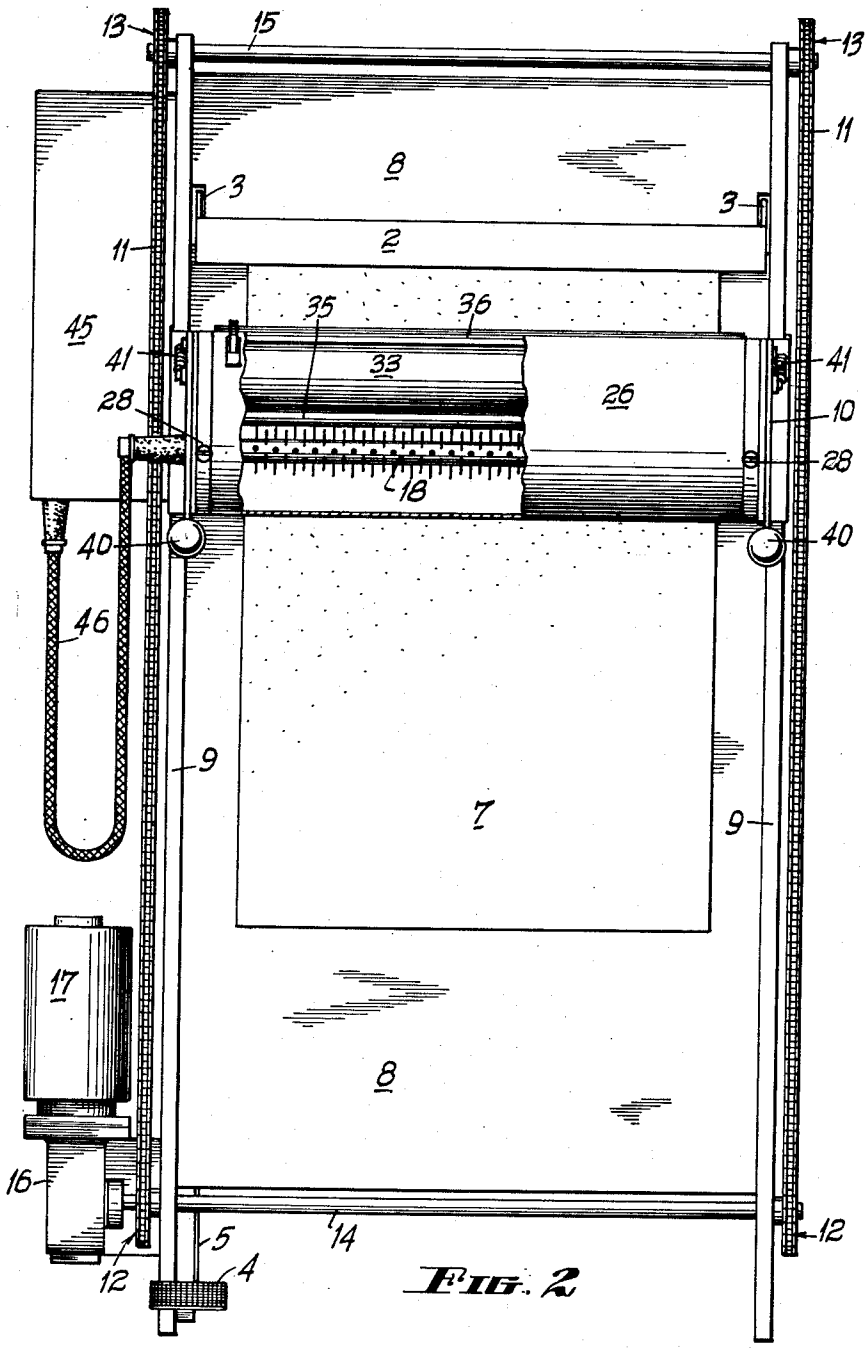

FIG. 2

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CHARGING AND/OR PRINTING UNIT FOR ELECTROPHOTOGRAPHIC PROCESSES

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Claims priority, application Australia Sept. 3, 1959
5 Claims. (Cl. 95—1.7)

This invention relates to an improved charging and/or printing unit for electrophotographic processes.

It is well known that when reproducing drawings, photographs, documents or the like by the electrophotographic method it is first necessary to charge the paper and to then produce the image thereon by bleeding away the charge at the required areas.

This is usually achieved by placing the paper into, or passing it through, a charging zone where the photoconductor surface on the paper is subjected to a high voltage field such as a corona discharge, after which the paper is subjected to the light image which then bleeds away the charge where the light strikes the surface, in proportion to the amount of light, after which development of the image so produced can take place by any of the known methods.

Various problems exist, however, in the charging of paper by the known methods, partly due to the difficulty of providing space for a large sheet of paper and the problem of moving it in a charging field which tends to cause the paper to hold on to the base due to static electricity and therefore makes it difficult to move the paper past the charging point. As the charging point carries high voltage, certain problems also exist in connection with that, and it is therefore the object of this invention to provide an improved apparatus which, if desired, can effect both the charging and the printing in the one mechanism but in which the processes can be carried out separately if necessary.

Briefly the invention comprises a member on which the paper to be charged and printed is mounted and over which member the charging and printing element moves at the required controlled speed, the element carrying charging means and the printing light so that a sheet may be charged and exposed through a negative or the like ready for development.

In order that the invention may be more clearly understood, an embodiment thereof will now be described with reference to the accompanying drawings in which:

FIG. 1 is a sectional side elevation of the unit,

FIG. 2 is a front elevation thereof with part of the protective case removed,

FIG. 3 is an enlarged detail of the charging roller support and drive and the pressure roller supports, the view being taken from end but in part section,

FIG. 4 is an enlarged detail of the holding clip, and

FIG. 5 is a modified light and charging system where simultaneous charging and exposure takes place.

According to the construction illustrated in FIGS. 1 to 4 a vertically place main frame **1** has on it a clip **2** which is mounted on arms **3** at each side pivoted to the frame **1** and is opened by foot pressure on a pedal **4** connected to the arms **3** by a link **5**, a spring **6** urging the clip **2** into its closed position.

A sheet **7** is pushed into position when the clip **2** is opened and will then be held suspended by the clip against a backing plate **8** when the opening pressure is released from the pedal **4**.

The front of the frame **1** forms a pair of tracks **9** which guide a transversely positioned carrier **10** which is moved on the tracks **9** by means of a pair of endless chains **11** so that it can traverse the whole of the area of the backing plate **8** on which the paper is suspended. The chains are supported on sprockets **12** and **13** carried on shafts **14** and **15** on the frame **1**, the lower shaft **14** having the sprockets **12** secured thereto and driven through a gear box **16** from a motor **17**. The motor **17** can be driven in either direction to cause the carrier **10** to be raised or lowered as required.

The carrier **10** supports on it a spiked charging roller **18** the shaft **19** of which is supported in insulating bearings **20** on the end plates of the carrier **10**. The roller **18** is driven through a rubber wheel **21** which contacts both the roller **18** and the plate **8** to revolve the roller **18** as the carrier **10** is moved up and down, the roller **18** being carried on an arm **22** which is slidable on a pin **23** fixed to the end plate of the carrier **10** and is urged forward by a spring **24** to hold the wheel **21** in contact with the roller **18** and the plate **8**.

The bearings **20** are formed of an insulating medium so that the required high voltage can be applied between the roller **18** and the backing plate **8**. A cover **26** extends over the charging roller **18** to prevent contact therewith during operation. The distance between the charging roller and the backing **8** can be varied by moving the insulated bearings **20** in slots **27** under control of threaded adjusting screws **28** which engage the bearings **20**.

During charging the paper or sheet **7** is forced down on to the backing plate **8** by the electrostatic charge generated on the paper, and generally tends to adhere uniformly to the plate **8**.

The foregoing mechanism serves to charge a xerographic sheet of paper or the like (such as the sheet **7**) as the charging roller is moved over the backing **8**.

Also positioned on the carrier **10** is a light source **30** located in a housing **31** having a slot **32** therein, the housing being encircled by a sleeve **33** with an opening therein so that by revolving the sleeve **33** on the housing **31**, the effective width of the slot **32** can be varied, and thus the light value reaching the sheet **7** is regulated.

The housing **31** is fixedly supported from the carrier **10**, but adjacent to the housing are a pair of rollers **35** and **36** which are carried on arms **37** pivoted on pressure bars **38** which are located by links **39** on the end plates of the carrier **10** and by levers **40** also pivoted to the end plates of the carrier **10**, springs **41** causing the rollers **35** and **36** to be urged on to the backing plate **8**.

The rollers **35** and **36** serve to overcome the difficulty which exists where a large sheet must have a negative pressed on to it. The present invention utilises the pair of rollers **35** and **36** as said, which are resilient and which are spaced slightly apart as shown and are mounted so that they traverse the photo-conductor surface and allow the light source **30** to operate through a small gap between them, the light source thus travelling with the rollers **35** and **36** so that, as the rollers move over the surface and press the negative into very close contact with

the paper at the local point between the rollers, the exposure is made.

The grip of the clip 2 is aided by a row of spikes 43 (see FIG. 4) projecting outwardly from the backing 8, the purpose of the spikes 43 being to firmly hold the photo-conductor paper or sheet 7 along its top edge and to continue to so hold it during the time the clip 2 is released to place the negative in position, reinstatement of the clip then also forcing the top edge of the negative on to the spikes to hold same firmly. The clip 2 has apertures 44 at the spike localities.

A high voltage generator for producing the corona or similar discharge may take any known form, the housing for such a generator being indicated by numeral 45 in the drawings. A lead 46 transfers the voltage to the shaft 19 of the roller 18.

Instead of using two passes of the carrier, charging and exposure can be effected on the one traverse, the negative in that case being in place on the xerographic paper or sheet and charging taking place through this with exposure to light immediately thereafter, or even simultaneously for it will be realised that if the negative has light intercepting sections through which charging can take place, the light will bleed away to charge in the remaining sections and will leave charged the sections where the light is intercepted. Such an arrangement may be particularly useful where prints are made from traced plans or the like, and is illustrated particularly in FIG. 5.

In this embodiment the light source 50 has the charging points 51 mounted on a member 52 adjacent the light source so that the corona effect passes to the xerographic sheet 53 between the two rubber rollers 54 and 55 which are pressed against the negative 56 to hold it down firmly on to the sheet 53 on the conductive plate 57. Springs 58 held on blocks 59 secured to the ends of the carrier 60 urge the rollers 54 and 55 against the negative 56.

The light source 50 is again disposed in a housing 63 having a slot 64, a split sleeve 65 encircling the housing 63 to control the amount of light reaching the charging and exposing area 65. The member 52 is mounted on insulation blocks 66 and the necessary charging voltage will be applied between the member 52 and the plate 57.

It will be realised that the light source may be in, or close to, the ultra-violet end of the spectrum which shows the most satisfactory response to the charge on the paper. The light source will of course be arranged to shine on the long area across the entire frame and the density can then readily be controlled by variation of either the effective size of the slot through which the light issues or the speed of movement of the light source.

While in the foregoing descriptions the light source 30 or 50 is shown independently of the charging roller 18 or the charging points 51, the light source itself can charge the paper by having the light source of such a nature that it can provide a corona discharge to charge the paper when the appropriate voltage is applied to the light source, it being known that the use of an evacuated tube or a gas-filled tube can have the function of producing light when a particular voltage is applied thereto, but variation of this can produce a corona discharge.

What we claim is:

1. An improved charging and printing unit for electrophotographic processes comprising a main frame, a backing plate of electrically conductive material carried by the said frame, means on said frame to hold a photoconductor sheet and negative on said backing plate, a pair of tracks on said frame extending along two opposite sides of said backing plate, a carrier movable on said tracks, means to move said carrier across said backing plate from end to end, charging means on said carrier extending across said plate but insulated from said carrier, means to apply electrical potential between said charging means and the said plate, a housing and light source on said carrier also spaced from said plate and extending across said plate, a slot in said housing facing said plate, and a pair of resilient pressure rollers mounted on said carrier to contact said plate on each side of said light source and press said negative and photoconductor sheet on to said plate.

2. An improved charging and printing unit for electrophotographic processes comprising a main frame, a backing plate of electrically conductive material carried by said frame, means on said frame to hold a photoconductor sheet and negative on said backing plate, a pair of tracks on said frame extending along two opposite sides of said backing plate, a carrier movable on said track, a pair of chains adjacent said tracks coupled to said carrier, sprockets on said frame to support said chains, means to drive said chains to move said carrier across said backing plate from end to end, a charging roller rotatably mounted on said carrier to extend across said plate but insulated from said carrier, driving means to revolve the roller when said carrier is moved over said plate, means to apply electrical potential between said charging roller and said plate, a housing and light source on said carrier also spaced from said plate and extending across said plate, a slot in said housing facing said plate, means to vary the effective width of the slot in the housing, and means to press said negative and photo-conductor sheet on to said plate.

3. An improved charging and printing unit for electrophotographic processes comprising a main frame, a backing plate of electrically conductive material carried by said frame, means on said frame to hold a photo-conductor sheet and negative on said backing plate, a carrier movable on said frame, means to move said carrier across said backing plate from end to end, a charging roller rotatably mounted on said carrier to extend across said plate but insulated from said carrier, a resilient insulating driving member engaging said charging roller and said plate to revolve said charging roller when said carrier is moved over said plate, means to apply electrical potential between said charging roller and said plate, a housing and a light source on said carrier also spaced from said plate and extending across said plate, a light slot in said housing facing said plate, a slotted sleeve on said housing adjustable to vary the effective width of the slot in the housing, and a pair of resilient pressure rollers mounted on said carrier to contact said plate on each side of said light source and press said negative and photo-conductor sheet on to said plate.

4. An improved charging and printing unit for electrophotographic processes comprising a main frame, a backing plate of electrically conductive material carried by said frame, means on said frame to hold a photo-conductor sheet and negative on said backing plate, a pair of tracks on said frame extending along two opposite sides of said backing plate, a carrier movable on said track, a pair of chains adjacent said tracks coupled to said carrier, sprockets on said frame to support said chains, means to drive said chains to move said carrier across said backing plate from end to end, a charging roller rotatably mounted on said carrier to extend across said plate but insulated from said carrier, a resilient insulating driving member engaging said charging roller and said plate to revolve said charging roller when said carrier is moved over said plate, means to apply electrical potential between said charging roller and said plate, a housing and a light source on the said carrier also spaced from said plate and extending across said plate, a slot in said housing facing said plate, a slotted sleeve on said housing adjustable to vary the effective width of the slot in the housing, and a pair of resilient pressure rollers mounted on said carrier to contact said plate on each side of said light source and press said negative and photo-conductor sheet on to said plate.

5. An improved charging and printing unit for electrophotographic processes comprising a main frame, a back-

ing plate of electrically conductive material carried by said frame, means on said frame to hold a photo-conductor sheet and negative on said backing plate, a pair of tracks on said frame extending along two opposite sides of said backing plate, a carrier movable on said track, means to move said carrier across said backing plate from end to end, a housing and light source on said carrier spaced from said plate and extending across said plate, a slot in said housing facing said plate, a charging member within the housing in the path of the light directed to said plate, means to apply electrical potential between said charging member and said plate, and a pair of resilient pressure rollers mounted on said carrier to contact said plate on each side of said light source and charging means to press said negative and photo-conductor sheet on to said plate.

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