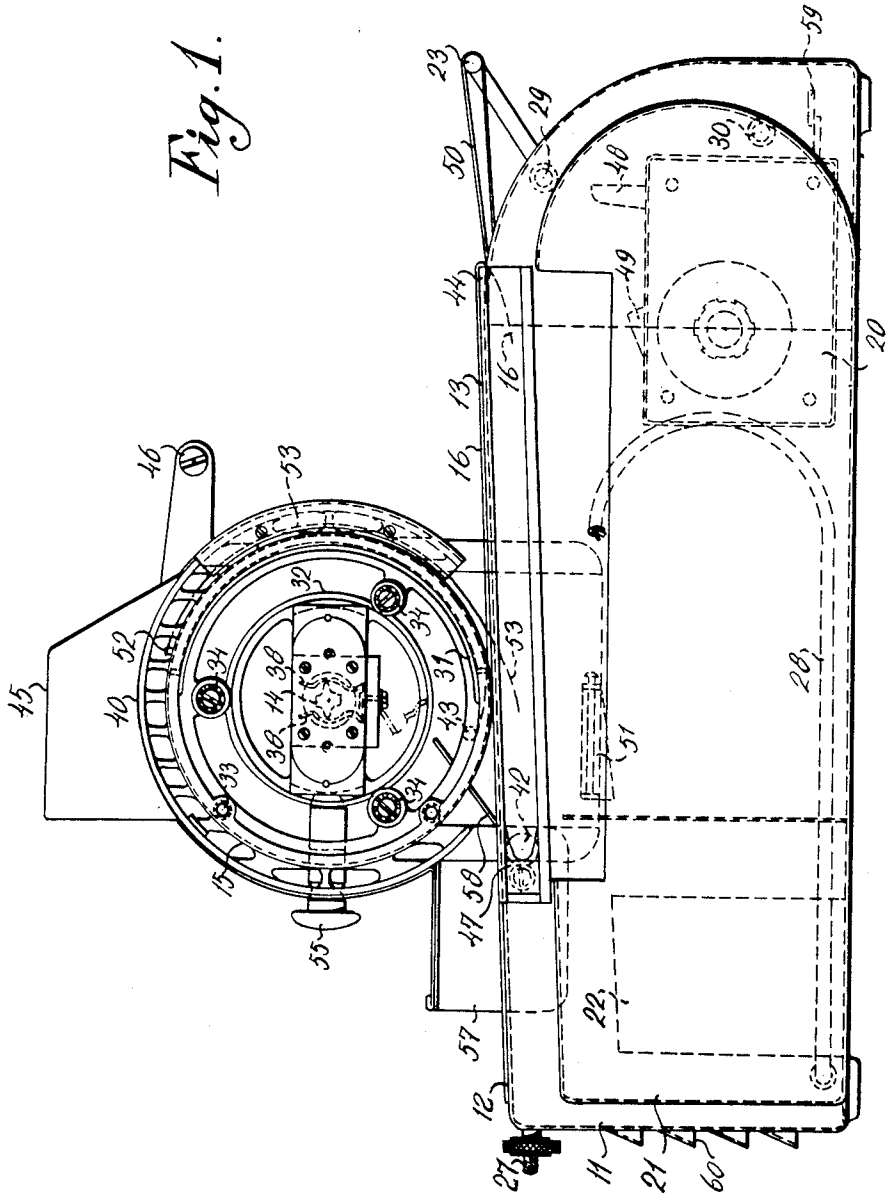
May 1, 1956 W. D. KENNEDY ET AL 2,743,653

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Filed March 4, 1953 3 Sheets-Sheet 1

Fig. 1.



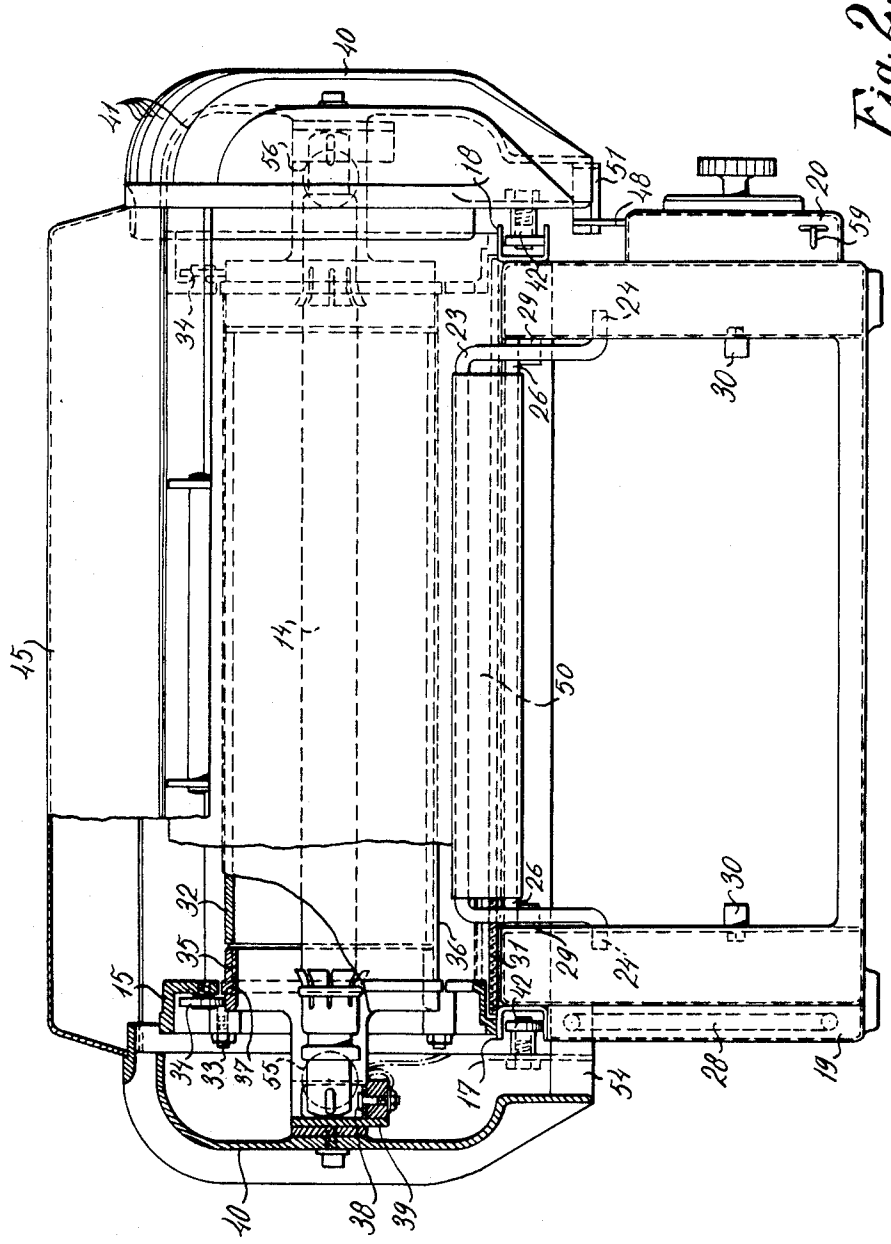
WALTER DAVID KENNEDY
SIDNEY JOSEPH FENTON
By Pollard and Johnston

May 1, 1956 W. D. KENNEDY ET AL 2,743,653

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Filed March 4, 1953 3 Sheets-Sheet 2

Fig. 2.



WALTER DAVID KENNEDY
SIDNEY JOSEPH FENTON
By
Pollard and Johnston

May 1, 1956 W. D. KENNEDY ET AL 2,743,653

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Filed March 4, 1953 3 Sheets-Sheet 3

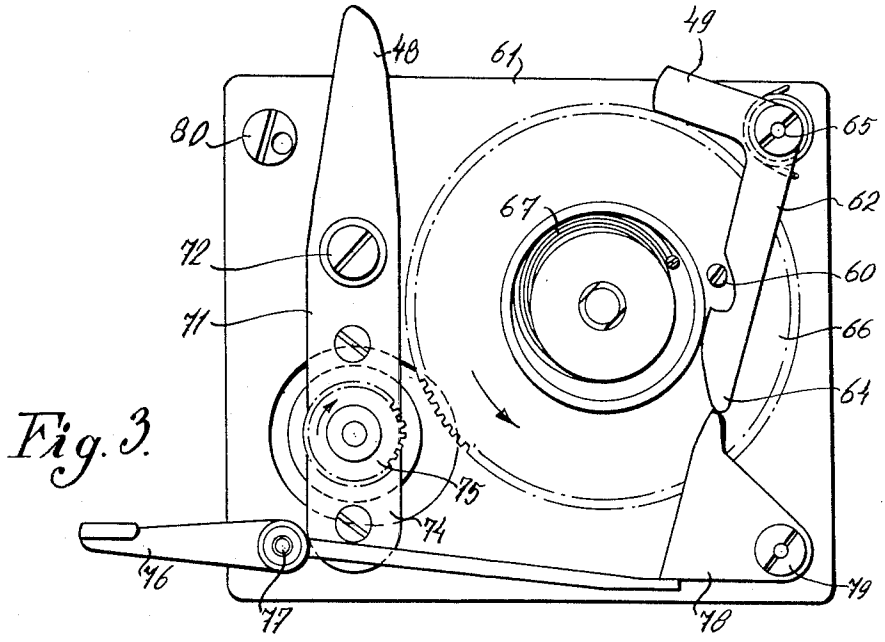


Fig. 3.

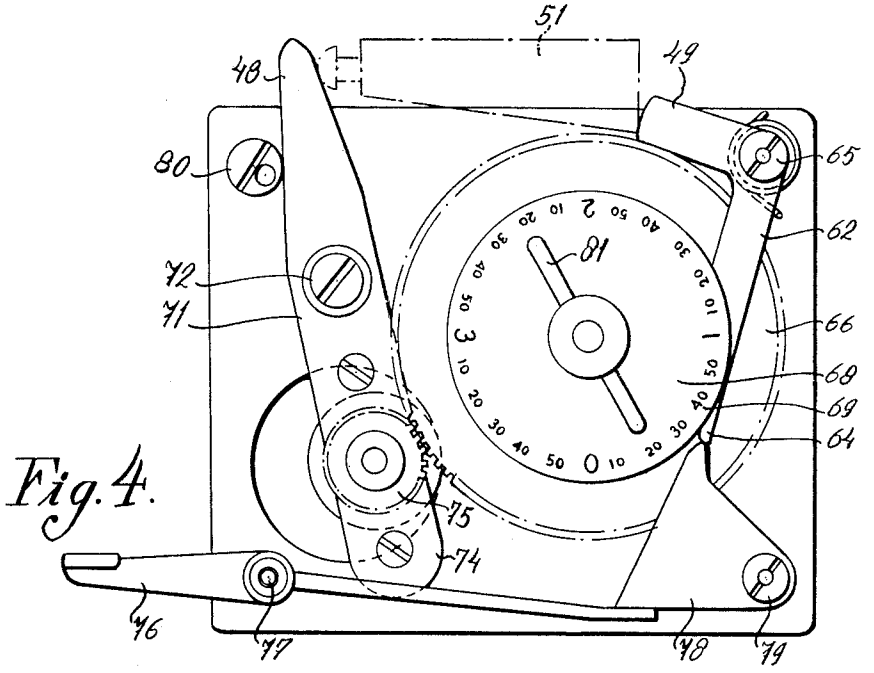


Fig. 4.

WALTER DAVID KENNEDY
SIDNEY JOSEPH FENTON
By Pollard and Johnston

United States Patent Office 2,743,653 Patented May 1, 1956

2,743,653

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Walter David Kennedy and Sidney Alfred Joseph Fenton, London, England, assignors, by mesne assignments, to Chemische Fabriek L. van der Grinten, N. V., Venlo, Netherlands, a corporation of the Netherlands

Application March 4, 1953, Serial No. 340,244

Claims priority, application Great Britain March 7, 1952

1 Claim. (Cl. 95—77.5)

The invention relates to photographic contact printing apparatus, comprising a rolling panel of translucent material curved in one direction, provided on its convex side with a flexible applying apron for applying under tension and for pressing the material to be exposed on to the panel, the said applying apron extending tangentially off the panel in the feeding position of the apparatus and following the surface of the panel in the working position of the apparatus.

The time during which the apparatus, to which the material to be exposed has been fed, has to be in the working position is determined by the exposure time, which depends on the luminous power of the source of light, on the sensitivity of the light-sensitive material, and on the translucency of the original to be copied. This exposure time varies, and has to be previously ascertained in each case.

When the exposure time has elapsed, it is desirable for the apparatus to return as quickly as possible to the feeding position, in order to avoid any further, mainly local, over-exposure of the material during this returning movement.

In order to facilitate the operation of the apparatus in this respect, according to this invention, the influence of gravity or of some other force is brought to bear on the panel in such a way that it is always drawn towards the feeding position (i. e. the position of rest), while a locking device is provided, by means of which it can be locked in the working position.

When the locking device in question is unlocked, the panel rolls back to the feeding position, with the applying apron being flattened out again.

By the application of the invention it is made readily possible to interrupt the exposure time automatically. In fact, according to the invention the locking device may be provided with a timing device adapted to unlock the locking device. It is thus sufficient on the one hand, when a copy is to be made, to place the apparatus in the working position and on the other hand to adjust the timing device to the desired exposure time. As soon as this time has elapsed, the apparatus returns automatically to the feeding position, the exposure thus being interrupted.

In the drawings an embodiment of the invention is illustrated.

Fig. 1 is a part-sectional end elevation of the apparatus.

Fig. 2 is a part-sectional side elevation of the apparatus.

Fig. 3 is a view of the timing unit in the apparatus at rest with parts taken away.

Fig. 4 is a view of the whole timing unit in the working position.

Referring to these drawings, the apparatus comprises essentially a box-like structure or support **11** having a sloping upper surface (rising from **12** to **13**) and carrying a rolling unit containing an electric lamp **14** capable of

emitting ultra-violet radiation, and wheels **15** on which the unit rolls. Associated with the rolling unit is an apron **16** adapted to wrap around the rolling unit. Stated in greater detail the apparatus is as follows.

A box-like structure **11**, conveniently made of sheet metal, is so constructed that when stood on a level surface it has a sloping upper surface, the level rising from **12** (the rear or back of the apparatus) to **13** (the front or working end of the apparatus). Near to this upper surface and on the sides of the structure **11** are channel shaped members **17** and **18** of which the channels open outwards. On one side of the structure **11** is a chamber **19** which is of sufficient width to house a power supply cable **28** for the lamp **14**. On the other side of the structure **11** is mounted a timing unit **20** of the character described in this application.

At the rear end of the structure **11** is a compartment **21** housing an electrical transformer **22** and provided with ventilating apertures **60**. The transformer **22** is usually necessary because the supply voltages obtainable are insufficient to power the form of lamp, e. g. a high-pressure mercury vapour lamp, which is most suitable for the apparatus of this invention. Where this situation does not arise, however, the transformer unit may be omitted.

Mounted in the open front of the structure **11** is a bar **23**, bent at the ends and pivoted at pivots **24**. There passes round this bar **23** and a floating bar **26** a fabric band **50** held under tension by reason of the bar **26** being secured by springs (not shown) to the rear of the structure **11**, adjusting knobs **27** being provided to enable its tension to be evenly adjusted across its width. The bar **23** may be moved up and down on the pivots **24**, its movement being limited by an upper stop **29** and a lower stop **30**. The springs are located so that in this movement the bar passes over the dead-centre position and is thus held by the springs in one or other of the end positions.

The rolling unit referred to above comprises an electric light **14**, a part cylinder of glass **31** and a complete cylinder of glass **32**, the arrangement being such that when the unit is rolled forward, the wheels **15** running on the tracks formed by the channel sections **17** and **18**, the part cylinder **31** wraps around itself the apron **16**. The two wheels **15** are held together by tie-rods **33** and support the part cylinder **31** so that its outer surface is at almost the same radius from the centre of rotation as the rims of the wheels **15**, the weight of the unit, however, being carried by the wheels **15**.

Mounted within the wheels **15** and supported by three ball races **34** in each wheel **15** is a metal cylinder **35**. The cylinders **35** make telescopic engagement with a central cylinder **36** the main part of which is cut away to provide an aperture for light from the lamp **14** to emerge through the cylinder **32**. The cylinders **35** have rims **37** which engage in the mounts for the ball races **34** and prevent end-wise movement of the co-operating cylinders **35** and **36**. The arrangement is therefore such that rotation of the wheels **15** carries the unit along the tracks **17—18** causing simultaneous rotation of the part cylinder **31**, which moves with the wheels, but causing only a translational movement of the axis of the cylinder **32** and lamp **14**. The lamp **14** therefore only gets the necessary and also a simple and quiet movement which is of considerable importance for the life of same.

The ends of the lamp **14** are held in clip type contacts **38** mounted on an insulating block **39**, one electric contact being at one end of the tubular lamp and the other at the other end of the lamp. The block **39** is held by extensions of the end cylinders **35** and also secured to end plates **40** which are provided with heat-dissipating fins **41**. Each end plate **40** is provided with a guide roller **42** housed within the channels **17** and **18** so that

on rolling movement of the wheels **15** the end plates **40** are checked against any tendency to rotate with the wheels, i. e. the end plates **40** and the cylinders **32**, **35** and **36** and the lamp **14** are held against rotation.

Secured at **43** to the wheels **15** is an apron **16** which extends along the surface of the structure **11**, secured to same at the forward end by turning it over at the upper edge **44** of the forward end of the structure and returns within the structure to be held under tension by springs, not shown, to the rear wall of the structure **11**. The apron is made up of a plurality of juxtaposed fabric strips. Adjustment screws (not shown) for the tensioning springs are provided so that the desired tension of the separate strips may be maintained. However, the apron may consist of a single wide band of material, but in this case the band should be tensioned at intervals across its width. The apron **16** is quite separate from the fabric band **50**.

Surrounding the upper and rear part of the rolling unit and attached to the end plates **40** is a metal hood **45** constructed and arranged so that, in conjunction with the cylinder **36** egress of light from the apparatus is substantially prevented. The hood **45** carries a handle **46** by means of which the rolling unit may be drawn forward.

The rearward motion of the rolling unit is checked by wedge-shaped rubber stops **47** located in the channels **17** and **18** and the forward movement is checked by contact between a spring-loaded buffer unit **51** located on the skirt of one of the end plates **40** and a lever **48** forming part of the timing unit **20**. The unit is held forward by the sear **49** which engages behind a plate at the rear of the buffer unit **51**, and the timing device is such that after a timed interval the sear is retracted so that the unit may roll back under gravity due to the inclination of the tracks **17** and **18**.

Attached to the wheels **15** at a position **52** are flexible ribbons **53** which are carried forward round the part cylinder **31** and, after crossing the path of the apron **16**, pass through an aperture in the top of the structure **11** to adjustable anchorages on the structure **11**. Preferably these anchorages are spring-tensioned. These bands serve to maintain the apron **16** under tension and also to hold the part cylinder **31** on to the wheels **15**. The spring-tensioning of the ribbons allows for small variations in the diameter of the elements **31** and **15**.

Thus, when the rolling unit is drawn forward by the handle **46**, the end plates **40**, cylinders **32**, **35** and **36**, lamp **14** and hood **45** move forward without rotation of any of the parts, the guide rollers **42** moving along the channels **17** and **18**, and the wheels **15** roll along the tracks **17** and **18** and cause the part cylinder **31** to roll along the band **16**. The edge of the part cylinder **31** is located so that when the unit is fully forward it registers with the forward edge **44** of the structure **11**. Since the apron **16** is secured to the wheels **15** and **43**, the apron is thereby wrapped around the cylinder **31** and accordingly a sheet of light-sensitive material and an original to be copied, if laid on the apron, will be brought into exposure position against the glass cylinder **31** and held there by the apron **16** until the rolling unit is returned, which will occur by gravity when the sear **49** is retracted.

When a document is so copied its trailing edge which is at the forward end of the apparatus is not moved so that the machine enables a page of a book to be copied. The book is placed on the band **50** with the page to be copied lying over the apron **16**, the edge **44** being at the fold of the book. Operation of the rolling unit curves the page to be copied round the cylinder **31** but exerts no tension on the page or on the rest of the book, which is therefore unharmed. On the return movement of the rolling unit the page acting as an original and the light-sensitive material are released. The return movement of the unit is controlled by the ribbons **53** and the tension on these and on the apron **16** control the accuracy of roll of the unit.

The lamp **14** is supplied with current via the cable **28** lying in the casing **19**. The cable is clamped to the structure **11** and, by a clamp **54**, to the skirt of one end plate **40** so that when the unit is rolled back and forth the cable rolls and unrolls freely in the casing **19**. The cable **28** passes the plug and socket **55** attached to the block **39** and from **55** heat-resisting insulated wires carry the current to the contacts **38**. The wire serving the other end of the lamp passes into plug and socket **56** before reaching the contact **38**. It is arranged that the plugs **55** and **56** are accessible through the end plates **40**, but the arrangement is such that it is impossible to remove the end plates without first removing the plugs and thus breaking the electrical circuit to the lamp.

A high wattage electric lamp **14** is required to carry out the process for which the apparatus is used. It is therefore necessary to make arrangements for dissipating waste heat and this is achieved by allowing air to flow round all parts of the rolling unit by means of natural convection. To this end, the unit is designed so that at either end of its travel it is open at the top and bottom to allow air to pass freely into and out of the apparatus via the inner surface of the part cylinder **31**.

In order to ensure an adequate and well distributed flow of air, the hood **45** is formed with a duct **57** through which air may pass to the inner tubes of the rolling unit.

A baffle **58** mounted on the top of structure **11** is so disposed that when the rolling unit is in its rear position air passing through the duct **57** is partly guided round the rear sides of the tubes in the rolling unit. This baffle **58** also acts as a guide for air passing into the rolling unit via a hole in the top of structure **11** and circulating around the front half of the tubes in the rolling unit. Ducts are also provided in the bottom and finned sides of the end plates **40**.

The forward movement of the rolling unit which rolls the document and copy paper on to the part cylinder of glass **31** also moves that part cylinder into such a position that light from the lamp **14** falls directly upon all parts of it and is not baffled by the metal cylinder **36**.

To ensure even distribution of the light over the whole of the surface of the part cylinder **31**, the inside surfaces of the cylinder **36** have a light diffusing surface of high reflectivity which is modified locally by the application of non-reflecting paint adjacent to the brightest part of the lamp **14**.

Correct exposure of the sensitized material is ensured by the timing device **20** to control the time of exposure. The type of lamp **14** used for the apparatus is not capable of being switched on and off at short intervals and it has therefore been arranged for the copy material and sensitised paper to be released from the machine after sufficient exposure, the lamp remaining switched on.

At the expiration of the time required to make the desired print, the sear **49** is released and the unit automatically moves to the back of the machine due to the action of gravity carrying it down the sloping top of the structure **11**, so removing the document and copy from the action of the light.

A hand release lever **59** is provided so that the rolling unit may be released manually if required.

The timing unit **20**, illustrated in detail in Figs. 3 and 4 comprises a plate **61**, on which is mounted a bell crank lever **62**. One end of the lever **62** constitutes the sear **49** of Figs. 1 and 2 and the other constitutes a release arm **64**. The lever **62** is spring-mounted on the pivot **65** so that the lever is urged clockwise on the pivot. The plate **61** further carries a gear wheel **66** which is urged by a spring **67** in clockwise movement. Mounted on the gear wheel **66** is a stud **60**. A cover-plate **68** is mounted on gear **66** (shown in Fig. 4) and carries a timing scale **69** and, at the zero index position a stop located in the rotational path of the stud **60**. This stop is not illustrated but lies immediately under the figure **0** on the scale.

Also mounted on the plate **61** is a lever **71** pivoted at

72 and projecting at one end 48 beyond the plate. The other end 74 of the lever 71 carries a gear 75 and a constant speed electric motor driving it clockwise. The latter is located behind the gear 75 and is not illustrated. Any good quality small synchronous motor may be employed.

Also mounted on the plate 61 is a hand control lever 76 pivoted at 77 and engaging at its further end with a cam 78, pivoted at 79 and itself engaging with the release arm 64. The pivots 65, 77 and 79, together with a bolt 80, constitute the means whereby the plate 61 is affixed to the printing apparatus, and the bolt 80 constitutes a stop for the movement of the lever arm 48.

In use the motor is started so that the gear wheel 75 is continuously rotating. The scale 69 is then moved to the required position—say 2 minutes, and locked in position by the wing nut 81. The stop associated with the zero index is thus pre-set and the gear 66 urged by the spring 67 moves around simultaneously (clockwisely), the extent of its movement being limited by the abutment of the stud 10 against the index stop. When the rolling unit of the printing apparatus according to Figs. 1 and 2 is rolled forward into its working position, the buffer 22 of same is made to engage with the sear 49 and, at the same time, to move the lever arm 48. Movement of the lever arm 48 brings the gear 75 into engagement with the gear 66 which latter then commences to rotate (anticlockwisely) and will continue to do so until the stud 60 reaches the lower inclined bearing surface of the release arm 64. By moving the release arm 64 the sear 49 is retracted and the rolling unit rolls away, the timing device then having assumed again its rest position.

If it is required to release the rolling unit before the expiry of the set period, this may be done by depressing the lever 76, thus moving the cam 78 and accordingly the release arm 64 and the sear 49.

It will be appreciated that instead of providing a continuously operating motor so that gear 75 rotates even in the position in which it is out of engagement with gear 66, a switching circuit may be incorporated so that depression of the sear 49 or movement of the lever arm 48 closes the circuit to the electric motor and retraction of the sear 49 or countermovement of the lever arm 48 breaks the circuit.

In a modification of the particular construction of the

timing unit a single bell-crank lever may be provided to replace elements 62, 49, 64, 65, 76, 77, 78 and 79, pivoted centrally, one end acting as the elements 62, 49, 64 and 65 and the other constituting the element 76.

What we claim is:

In a contact photoprinting apparatus, a rollable exposure member comprising a curved light-pervious panel having an outer surface convex in one direction and straight in the transverse direction, a support providing a track on which said member is rollable bodily to and fro along a path substantially tangent to said surface between a feeding position at a backward part of said track and a working position at a forward part thereof, a flexible apron for applying to said surface sheet material to be exposed through said panel, said apron having a portion held to said surface and having a terminal portion anchored to a forward part of said support so that the apron extends tangentially forward from said surface to said terminal portion to receive sheet material laid thereover, when said member is in feeding position, and is wrapped about said surface by the forward rolling of said member to working position, said track sloping downwardly from said forward part towards said backward part thereof so as to bias said member to roll backwardly to said feeding position under gravity from any location away from that position, releasable locking means at a forward part of said support for holding said member releasably in said working position against the bias of said sloping track, a timing device on said support, and means operated by said timing device after a predetermined period of its operation for releasing said locking means and thus causing said member to roll to said feeding position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,894,004	Rose	Jan. 10, 1933
2,041,478	Niederle	May 19, 1936
2,681,604	Van Der Grinten	June 22, 1954
2,681,605	Van Der Grinten	June 22, 1954

FOREIGN PATENTS

984,057	France	Feb. 21, 1951