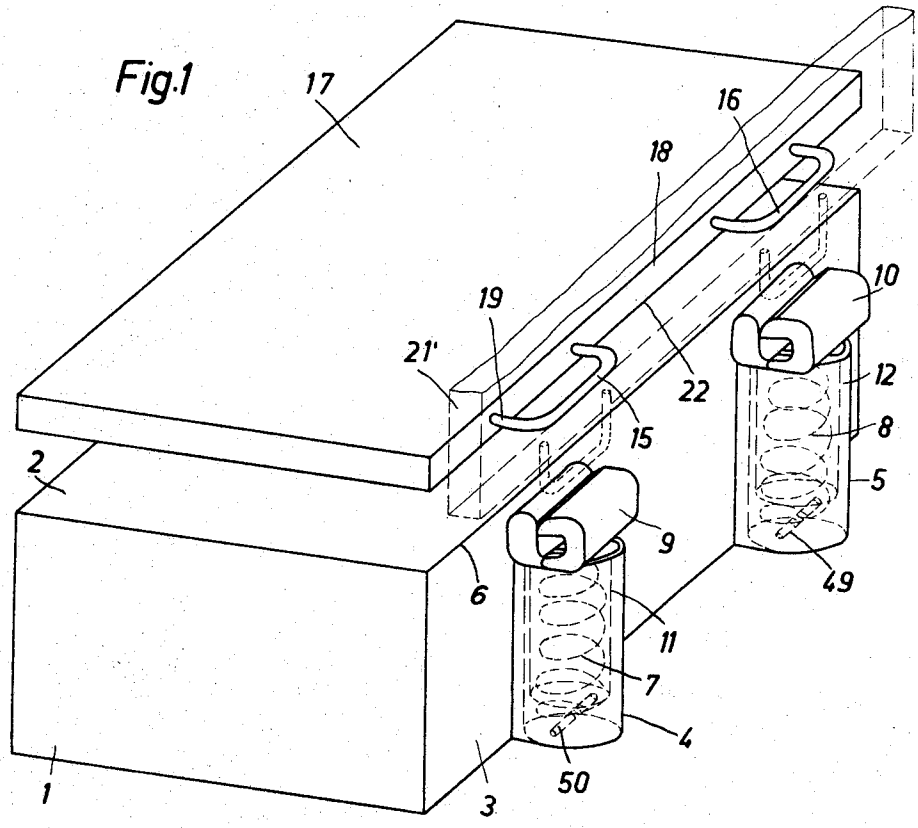
Nov. 14, 1967 W. SALGER 3,352,222

CONTACT PRINTING DEVICES

Filed March 17, 1965

4 Sheets-Sheet 1

Fig.1



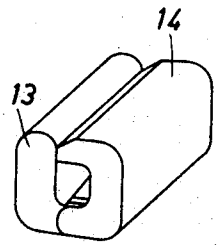


Fig.1a

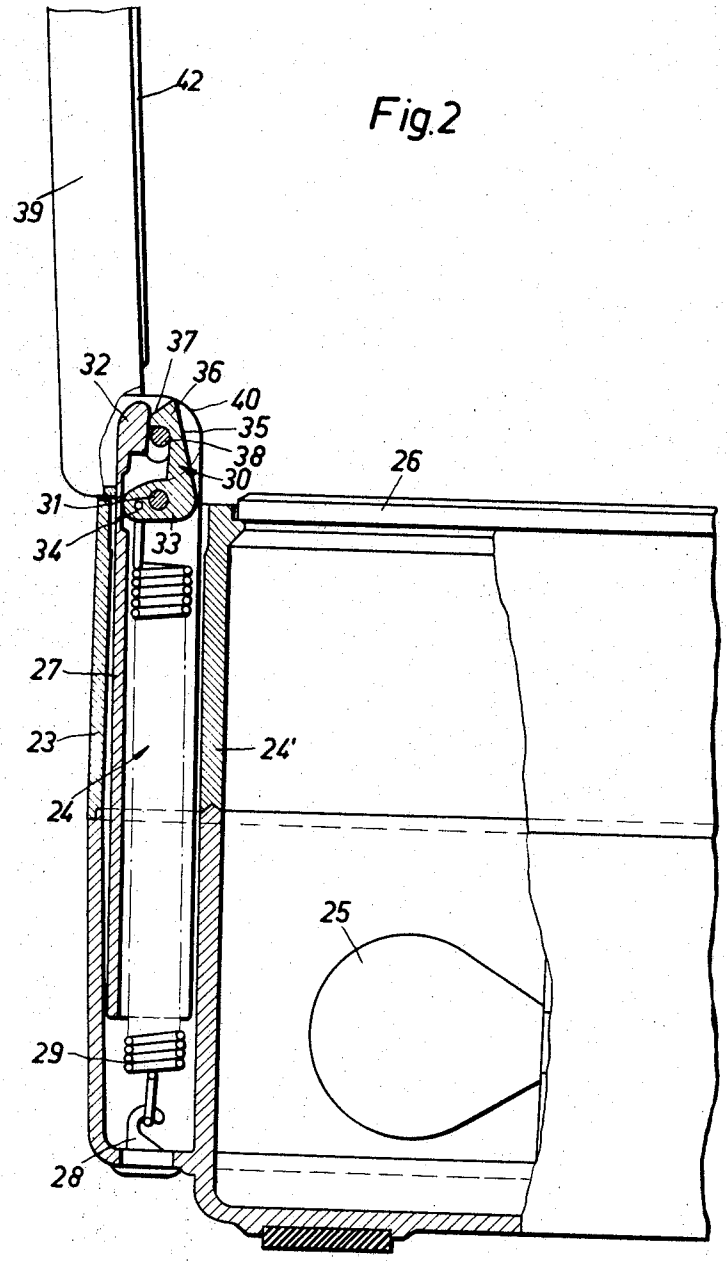
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CONTACT PRINTING DEVICES

Filed March 17, 1965 4 Sheets-Sheet 2

Fig.2



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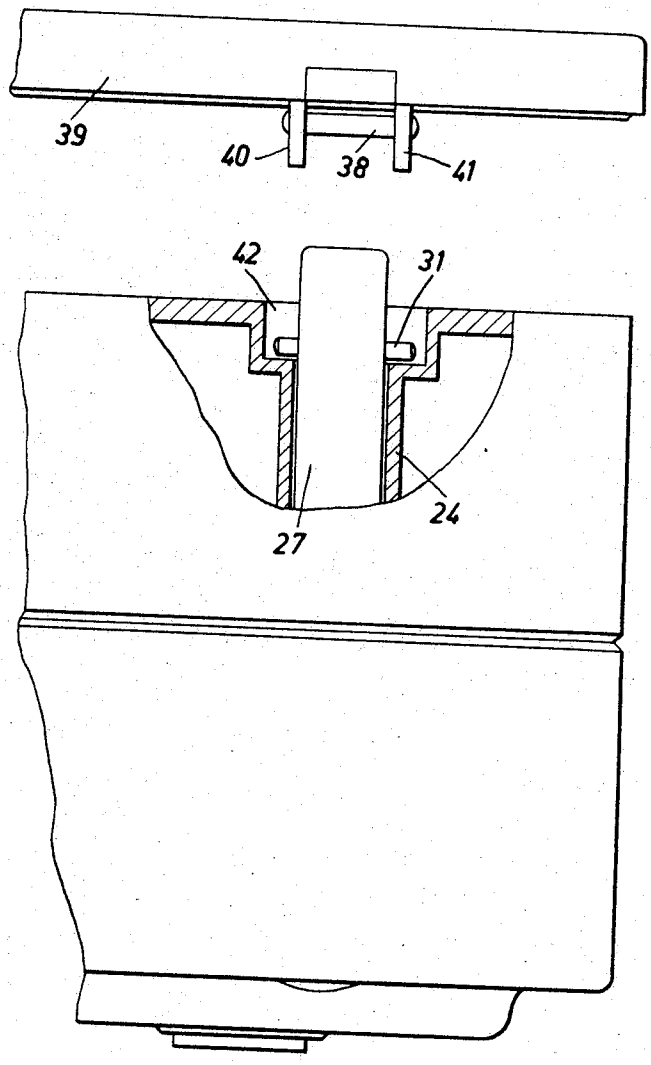
3,352,222

CONTACT PRINTING DEVICES

Filed March 17, 1965

4 Sheets-Sheet 3

Fig.3



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Nov. 14, 1967 W. SALGER 3,352,222

CONTACT PRINTING DEVICES

Filed March 17, 1965 4 Sheets-Sheet 4

Fig. 4

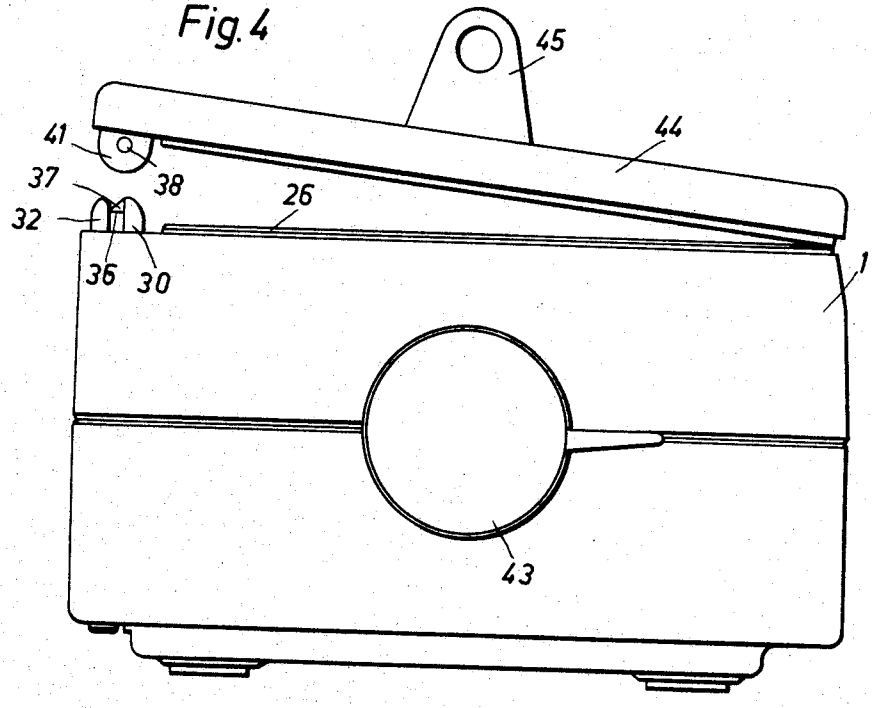
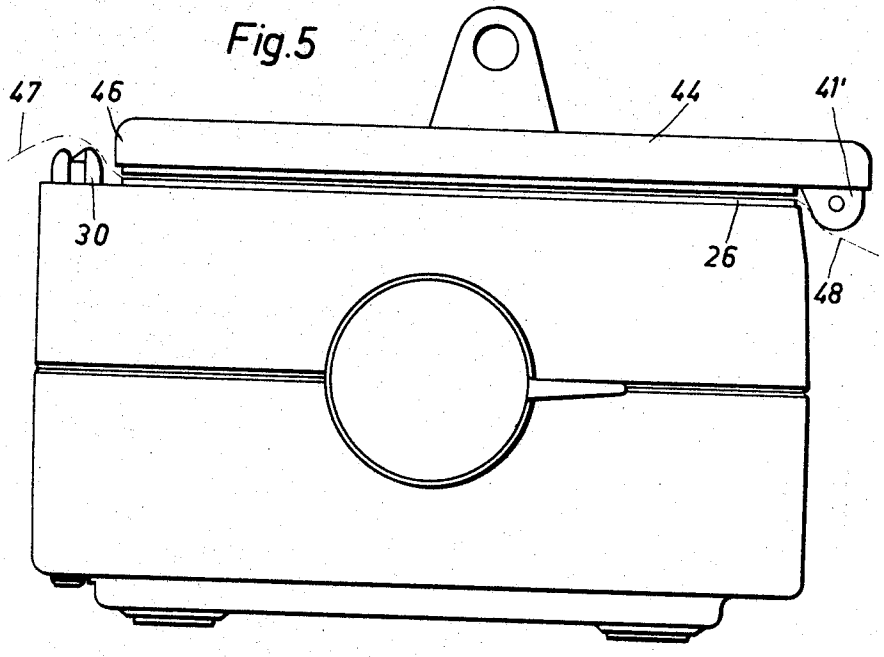


Fig. 5



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United States Patent Office

3,352,222

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3,352,222

CONTACT PRINTING DEVICES

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Claims priority, application Germany, Mar. 28, 1964, L 47,440
8 Claims. (Cl. 95—73)

ABSTRACT OF THE DISCLOSURE

A contact printing device using a contact surface and cover for maintaining the material to be reproduced upon the contact surface. The cover being pivotally supported in a removable manner upon the device housing, wherein oversize and thick originals may be copied, and wherein the cover hinge support is translatable with respect to the plane of the contact surface to withdraw the hinge means from an interfering position.

In such surface exposure devices light sources, for example, are provided as sources of radiation disposed on the side of the casing surface remote from the contact cover. These sources of radiation may alternatively be sources of thermal radiation if, for example, copying materials which are selectively sensitive to heat are used. The term "surface exposure device" is also used to include devices incorporating these thermal radiation sources since the process which is effected by the thermal radiation corresponds to the exposure process which is effected in the case of light-sensitive photographic paper. By this process, in the case of heat-sensitive papers, the developing and/or fixing of the paper can be included at the same time.

In general, glass is used as the contact surface. However, the present invention also includes the use of other materials, the actual material depending upon the type of radiation source which is being used.

In one embodiment, the present invention is based upon an already proposed surface exposure device which is described in German patent application L 45,477. In the surface exposure device which is the subject of this earlier application, the contact cover can be raised and lowered by means of hinges which are themselves adjustable as to height in a guide in opposition to the effect of a spring. Thus, originals of different thicknesses can be accommodated automatically without special adjustments being necessary. This known device which is characterised by its simplicity of construction makes possible a particularly simple manual operation in which the movement of the cover towards its contacting position automatically effects this adaptation or compensation for the form and thickness of the original.

According to this known device, the hinges are arranged on support tubes which are movable in tubular guides. The spring thus grips through the support tube so that it can be made of considerable length. The tubular guide has the advantage of being positioned laterally from the tiltable cover and also of being a comparatively large distance away from the contact surface, i.e. this being advantageous in the copying of comparatively thick originals.

The manual operation of this known surface exposure device is however comparatively limited, since because of the linkage connection between the cover and the casing of the exposure device one side of the arrangement is always closed for all practical purposes. This closed side therefore does not permit the edge of the original to overlap the device. Consequently it has been the practice heretofore to manufacture such surface exposure devices with an extremely large contact surface in order to accommodate originals of different sizes. The means of illumination or radiation have therefore had to be positioned to cover the whole of the contact surface. However, even with such expensive arrangements, a restriction as to the shape of the originals cannot be avoided, and this is found to be particularly disadvantageous in offices and the like. While such establishments usually deal with ordinary sheet sizes larger contact surfaces must in general, be taken into account with known surface exposure devices, with the result that the operating costs are higher because of the means which are employed. In spite of this expense however, the range of use is still limited.

In another known form of surface exposure device, for use particularly in the copying of books, surfaces which are inclined to one another are provided on which the two covers of the book can be rested. Such a form of device requires special expense with regard to the manufacture of the parts, in which case the question of the size of the book need not be specially considered, and in addition, such instruments are completely unsuitable for the manufacture of copies from sheet-form originals, or from originals which are arranged on a table, if the size of the original exceeds the size of one page of the book.

The present invention has as one object the creation of a surface exposure device which, while being of smaller dimensions so as to conform to a standard size, also enables copies to be produced from larger size originals without being damaged by folding, bending or the like.

This object is effected according to the present invention by the hinges being made so as to be capable of opening and by the contact cover being held releasably in the hinges.

Thus, in an advantageous form of the device, the hinges are arranged to be retractable in associated guide-ways after the contact cover is released, so that the contact surface is freely available without any raising of its edges being necessary. An original of greatly increased dimensions can thus be placed over the contact surface so that a section which is to be exposed lies directly on the contact surface. A downward pressure can then be produced by means of the freed contact cover which is lowered manually.

According to a preferred embodiment of the present invention, the hinges are formed as spring clips so that release of the contact cover can be effected in opposition to the spring action. Thus, these hinges are preferably of the type known as snap-release hinges in which an element which is pivotally supported under the action of the springs is associated with a hinge member and in which one of these parts is provided on its upper side with a surface which is inclined relative to the other part. By the downward pressure of a link member fitted on the contact cover on the hinge the member which is pivotable under the spring action pivots and automatically guides the link member so that it is supported by the pivotable hinge element. The inclined surface can thus provide a lock by means of which the spring clip can be opened for release of the contact cover.

In the same manner as the above-mentioned, known type of device, another preferred embodiment of the present invention is provided wherein the spring which permits height adjustment of the hinge is secured to the pivotable hinge part in order to hold this member resiliently against the hinge member associated therewith. This has simultaneously the advantage that the hinge formed as a spring clip is closed with much greater power the greater the load on the contact cover in the region of the hinge, i.e. the thicker the original. If the contact

cover is raised a considerable distance above the contact surface, the springs provided for resiliently guiding the contact cover become stressed so that they not only hold the hinges closed, but also provide for this adaptation with increased force as well. A particularly advantageous feature of the invention is provided by this combination.

Preferably, the hinge element is arranged as a double-armed pivotable lever in a guide-way for the hinge. In this connection, the hinge element is preferably formed as a bell-crank lever whose one part acts as a double-armed lever which is supported at its central region and on whose one end the spring grips, while the other end carries the other part of the bell-crank lever which is formed as a hooked spur.

It should be noted that the link members of the contact cover preferably include pins which can be pushed into the hinges. These pins are preferably arranged on bow-shaped supports which project downwardly beyond the pressure surface. By using tubular guide-ways for the hinges, a further preferred embodiment of the present invention is provided in which these tubular guide-ways each have at their upper ends an enlarged portion extending parallel to the link member axis, this enlargement receiving a pivot shaft for the hinge element. This pivot shaft projects laterally through a support tube which is movable in the guide-ways and which carries the hinge at its upper end, and determines the lowest position of the hinge at the bottom of the enlarged portion. The enlarged portion may also receive bracket supports for the link pins on the contact cover in order to permit satisfactory positioning of the contact cover for flat originals.

The present invention also includes an embodiment in which after release of the contact cover the hinges are retracted into the tubular guide-ways, and in which supports for the link pins are provided on the side edge of the contact cover above the pressure surface, so that there is no obstacle to the manual operation of the contact cover on the pressure surface. By using bracket supports on the contact cover which project downwardly beyond the pressure surface an advantageous embodiment of the invention is provided in which the supports are arranged on one longitudinal edge of the contact cover and in which the released cover is rotatable, whereby these supports act as abutments on the contact surface or on the casing of the device.

It will be seen that the cover can be provided with a hand grip in known manner for easy manipulation, especially after release of the cover from the casing of the surface exposure device, this hand grip preferably being provided in the central region of the contact cover.

In order that the invention may be more readily understood, certain embodiments thereof will now be described in detail by way of example and with reference to the accompanying drawings, in which:

FIGURE 1 is a perspective exploded view of a simple embodiment of contact printing device according to the present invention;

FIGURE 1*a* is an enlarged view of part of FIG. 1;

FIGURE 2 is a partial rear view, partly in section, of a preferred embodiment of contact cover linkage;

FIGURE 3 is a side view, partly in section, of a device embodying the features of FIGURE 2, only part of the device being shown and the cover being shown as removed.

FIGURE 4 is a side view of the device of FIGS. 2 and 3 with the released contact cover in a position before it is brought into engagement with the hinges; and,

FIGURE 5 is a side view corresponding to FIGURE 4, in which the released contact cover has been rotated through 180° and has been lowered on to the contact surface, the outline of a large size original being indicated by a broken line.

Referring now to the drawings, FIG. 1 shows a surface exposure device having a box-shape casing **1** in which sources of radiation (not shown) are arranged. The top side of the casing **1** is formed as a contact surface **2** which is permeable to radiation. On one longitudinal side wall **3** of the casing are arranged tubular guide-ways **4, 5** which terminate a short distance below the relevant edge **6** of the contact surface **2**. Tension springs **7, 8** which carry hinges **9, 10** in the form of spring clips at their upper ends are disposed in these guide-ways **4, 5**. The hinges **9, 10** are sufficiently wide that they are prevented from being drawn down into the tubular guide-ways **4, 5**, and are arranged so that in one position the upper edges of the hinges lie below the edge of the contact surface **2**. The tension springs **7, 8** are secured adjacent to the bottom of the guide-ways **4, 5** by providing them with cross-bars **49, 50** which are anchored in the guide-ways.

The hinges **9, 10** can be constructed with support tubes **11, 12** in order to retain a certain lateral movement in the tubular guide-ways. The spring clips themselves (see FIG. 1*a*) each comprise a comparatively rigid member **13** and a resilient pivotable snap member **14** which upon pressure from above opens to make way for a pin-type link member **15, 16** secured to a contact cover **17**.

This contact cover **17** has the same dimensions as the contact surface **2**. The bow-shaped or bail-like link members **19, 20** which include the pins **15, 16** respectively as a part thereof project from one longitudinal side surface **18** of the contact cover **17**. The bow-shaped link members **19, 20** lie in the plane of the contact cover.

The contact cover **17** is shown in FIG. 1 in full lines in its released state. It is thus rotatable or displaceable over the ccntact surface **2** in any arbitrary manner. Since the hinges **9, 10** lie beneath the contact surface **2** and since the link members **19, 20** lie in the plane of the contact cover, although extending beyond the side of the contact cover, it can be seen that an original which is to be copied can be placed on the contact surface **2** without hindrance.

If it is desired to bring the link member **19, 20** into engagement with the hinges **9, 10**, then the contact cover **17** is moved into the position indicated by the broken lines **21'** in FIG. 1 so that it can move past the side wall **3** of the casing and so that the pins **15, 16** can be pressed into the spring-clip type hinges **9, 10**. If now, the contact cover **17** is pivoted into the position shown in full lines in FIG. 1, the hinges **9, 10** are automatically raised from the guide-ways **4, 5** to the required height. Thus, the edge **22** of the contact cover can ride on the adjacent edge of the contact surface **2**. The support tubes **11, 12** thereby ensure sufficient lateral guidance.

Referring now to FIG. 2, this shows a section through the casing of a contact printing device with the rear wall **23** corresponding to the side wall **3** of FIG. 1. A tubular guide-way **24** is disposed inside this rear wall **23** and is separated from the inner compartment of the casing by a dividing wall **24'**. Within the casing is arranged a source of radiation **25** and above it the contact surface **26** corresponding to the contact surface **2** in FIG. 1.

A support tube **27** of considerable length is disposed the tubular guide-way **24**, and in this embodiment the support tube is not completely closed. At the lower end of the guide-way **24** is located a hook **28** for securing one end of a comparatively long tension spring **29** which extends up through the support tube **27** which is open on one side. At the top of the tube the spring **29** is attached to a hinge element indicated generally by reference numeral **30**. This hinge element **30** is pivotable about a hinge shaft **31** which is mounted in the support tube **27**. The hinge shaft **31** is preferably of such a length that it projects, as shown in FIG. 3, laterally from the support tube.

The support tube **27** extends upwardly on its closed side to form a rigid hinge member **32**. The hinge element **30** is formed as a bell-crank lever. In the central region of its one wing portion **33** the bell-crank lever is provided with a bearing aperture for the hinge shaft **31**. The free end of the double-armed lever so formed by the wing portion **33** and the central shaft **31** is provided with an aperture **34** which serves as a point of attachment for the spring **29**. The other end of the double-armed lever carries a hooked spur **35** which has a projecting portion **36** at the top. This projecting portion **36** rests against the hinge member **32**. The projecting portion **36** has an inclined surface **37** which extends down from the apex of the portion to the hinge member **32**. This inclined surface **37** has the effect that the hinge element **30** is pivoted in a clockwise sense when a link pin **38** on the contact cover which is indicated generally at **39** is pressed down against the hinge.

The underside of the projecting portion **36** extends substantially horizontally in the closed position of the hinge. In this manner, the link pin **38** is securely retained since the spring **29** holds the hinge element **30** in its closed position.

The link pin **38** is mounted on the contact cover **39** (see also FIG. 3) in brackets **40**, **41** which, as shown particularly in FIG. 2, project beyond the pressure surface **42** of the contact cover **39**.

In the hinged-open position of the contact cover as shown in FIG. 2, the hinge element **30**, and in particular the apex of the projecting portion **36**, is accessible, so that the spring clip forming the hinge can easily be opened and so that the contact cover **39** can then be raised clear of the hinge.

It will thus be apparent that this spring clip is automatically opened if the link pin **38** is pressed down against the inclined surface **37** and that the link pin **38** then snaps into the spring clip.

Referring now to FIG. 3, it can be seen that the tubular guide-way **24**, which in this embodiment is shown on the opposite side of the casing as compared with FIG. 1, is separated from the inner compartment of the casing by the dividing wall **24'**. The tubular guide-way **24** is provided at the top with an enlarged portion **42** extending parallel to the adjacent side wall of the casing. The portions of the hinge shaft **31** which project laterally outwards from the support tube **27** are arranged to extend into this enlarged portion of the guide-way and the lowest position of the support tube **27** is thus determined by the striking of the shaft portions against the bottom of the enlarged portion. The enlarged portion **42** is so much wider than the support tube **27** that the brackets **40**, **41** can be inserted into the enlarged portion so that one bracket lies on each side of the support tube or of the hinge member **32** (FIG. 2) which forms part of the support tube. Thus, the conditions for a satisfactory positioning of the contact cover **39** on the contact surface are created by the provision of the link and hinge connection.

It will be apparent that with the embodiments shown in FIGS. 1–3 the support tubes can be lifted in the tubular guide-ways with resultant tensioning of the springs **7**, **8** or **29** if the contact cover is pressed on to a thick original.

FIG. 4 shows a casing **1** on which an adjusting means **43** is provided for controlling the source of radiation. Above the casing in released relation thereto is a contact cover **44**. This contact cover has a hand grip **45** provided for example, in the central region thereof. The contact cover **44** is indicated in a position before it is brought into gripping engagement with the hinge. The hinge member **32** and the hinge element **30** with its projecting portion **36** can also be seen. The bracket **41** is visible on the contact cover **44** and this bracket **41** is provided with an aperture through which the link pin **38** passes. If the contact cover **44** is pressed down in the

position indicated, then the hinge element **30** will be pivoted in a clockwise sense through the wedge action of the inclined surface **37**, i.e., to the right in FIG. 4, so that the link pin **38** snaps home under the projecting portion **36**.

In the arrangement shown in FIG. 5, the contact cover **44** has been rotated through 180° from the position shown in FIG. 4. The bracket **41'** is located on the right-hand side adjacent to the rear wall of the casing, while the side edge **46** of the contact cover lies in front of the hinge element **30** and at a distance therefrom. An original held between the contact surface **26** and the contact cover **44** may thus extend as shown by the broken lines **47**, **48** on both sides of the contact surface under the bracket **41'** and/or over the hinge and hinge element **30** without the original being bent. It will be seen that originals can therefore be copied which are larger in size than the contact surface.

I claim:

1. A surface exposure device for use in contact printing which comprises, in combination, a housing having a base and side walls having upper edges, a radiation-permeable contact surface mounted upon said upper edges of said side walls, radiation-emitting means disposed in said housing below said contact surface, hinge means mounted on one of said side walls, a contact cover pivotally mounted in said hinge means in such a manner as to be able to press a copy sheet and an original onto one another on said contact surface, said hinge means including a pair of relatively movable elements adapted to selectively grasp said cover in a pivotal connection and permit said cover to be removed from said hinge means upon separating said elements whereupon said contact cover is released from said hinge means and can be removed from said housing.

2. A device as in claim **1**, in which several hinge means are mounted on said side walls, said hinge means elements defining spring clips, link pins mounted on said contact cover, said link pins extending parallel to the plane of a pressure surface defined on said cover, said elements of said spring clips defining a slot accessible from above into which said link pins can be pressed due to resilience of said elements and from which said link pins can be withdrawn.

3. A surface exposure device as in claim **1**, a pair of elongated hinge guide-ways mounted on said housing substantially perpendicular to said contact surface, a hinge support movably mounted in each of said guide-ways, one of said hinge means elements being rigidly fixed on said support and the other of said elements being resiliently mounted on said support and biased toward engagement with said rigidly fixed element.

4. A surface exposure device as in claim **1**, wherein one of said hinge means elements is pivotally mounted with respect to the other hinge means element, a spring biasing said one element toward engagement with said other element, an upwardly inclined surface defined on at least one of said hinge means elements, and link pins mounted on said contact cover extending parallel to the plane of said contact cover, engagement of a link pin with an inclined surface automatically springing apart said hinge means elements upon downward pressure of such link pin upon an inclined surface.

5. A surface exposure device for use in contact printing which comprises, in combination, a housing having a base and side walls having upper edges, a radiation-permeable contact surface mounted upon said upper edges of said side walls, radiation-emitting means disposed in said housing below said contact surface, an elongated hinge guide-way mounted on said housing having an axis substantially perpendicular to said contact surface, a hinge support movably mounted in said guide-way for movement toward and away from the plane of said contact surface, hinge means mounted on said hinge support, a

contact cover adapted to be pivotally connected to said hinge means and spring means biasing said hinge support in a direction to bias said contact cover toward said contact surface.

6. A surface exposure device as in claim 5, an abutment defined on said guide-way selectively positioning said hinge means below the plane of said contact surface, said spring being located in said guide-way and anchored at one end below the plane of said contact surface, at least one bow-shaped link member defined on said contact cover extending in the plane of the contact cover and including a link pin extending parallel to the plane of the contact cover for releasable engagement with said hinge means.

7. A surface exposure device as in claim 5, said hinge means consisting of a rigid hinge member and a hinge element pivotable relative thereto, said hinge element comprising a double-armed pivot lever, said spring being attached to said double-armed pivot lever and biasing said hinge element resiliently against the associated hinge member.

8. A surface exposure device as in claim 5, in which said guide-way comprises a tubular element, said hinge support comprising a support tube which is movable in said tubular element, said spring being guided through said support tube in said tubular element, said tubular element having an enlarged portion at its upper end adjacent said contact surface, a pivot shaft defined in said hinge means projecting laterally through said support tube and engaging in said enlarged portion determining the lowest position of said hinge means, and support means defined on said cover adapted to extend into said enlarged portion upon said cover being pivotally connected to said hinge means.

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