United States Patent [19]

Woolley, Jr. et al.

[11] **3,900,257**

[45] **Aug. 19, 1975**

[54] **REGISTRATION DEVICE FOR PRINTED CIRCUITS**

[75] Inventors: **Harold Oakley Woolley, Jr.**, Hershey; **Bernard Groene Ryle**, Camp Hill, both of Pa.

[73] Assignee: **AMP Incorporated**, Harrisburg, Pa.

[22] Filed: **Jan. 21, 1974**

[21] Appl. No.: **435,144**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 357,050, May 3, 1973, abandoned.

[52] **U.S. Cl.** **355/29;** 355/53; 355/96; 226/57; 226/62

[51] **Int. Cl.**[2] **G03B 27/42**

[58] **Field of Search** 226/57, 58, 59, 62; 355/28, 29, 53, 54, 86, 95, 96, 98, 102, 97

[56] **References Cited**

UNITED STATES PATENTS

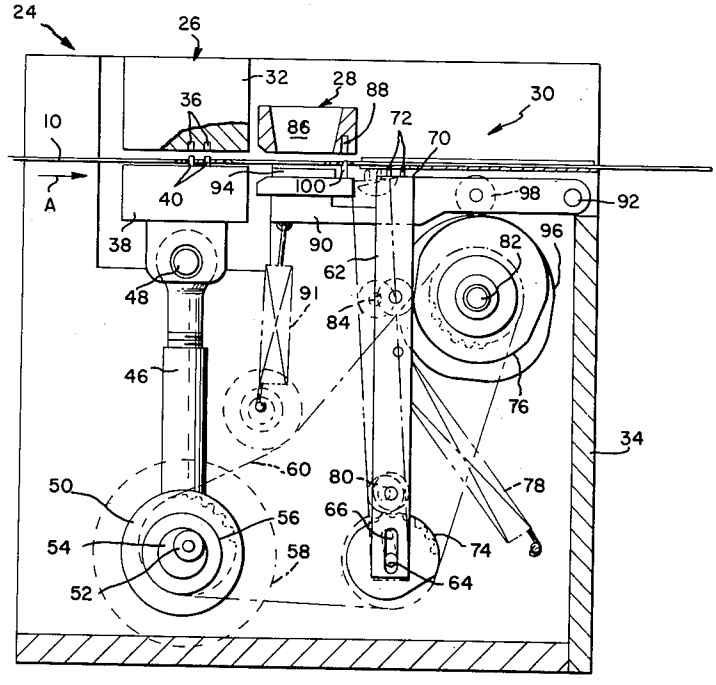
1,834,496	12/1931	Owens	226/57
1,895,026	1/1933	Debrie	226/57
2,626,146	1/1953	Goetz et al.	226/57
2,772,325	11/1956	Gaite	226/57 X
2,824,736	2/1958	Allen	226/58
3,618,837	11/1971	Jacobsen	226/57
3,660,203	5/1972	Beck et al.	226/58 X
3,771,871	11/1973	Rattman	355/102

Primary Examiner—Samuel S. Matthews
Assistant Examiner—Alan Mathews
Attorney, Agent, or Firm—Russell J. Egan, Esq.

[57] **ABSTRACT**

A device for producing printed electrical circuits on flexible webs in registration with perforations in the web includes a transport mechanism for moving the web in a step-wise fashion through a station where perforations are formed on the web, and a station where the circuit is formed on the web in predetermined relation to the perforations formed on the web. The perforations can be placed in the web in any desired configuration, including on either or both lateral edges, between the separate circuit patterns, and within the individual circuit patterns.

16 Claims, 7 Drawing Figures



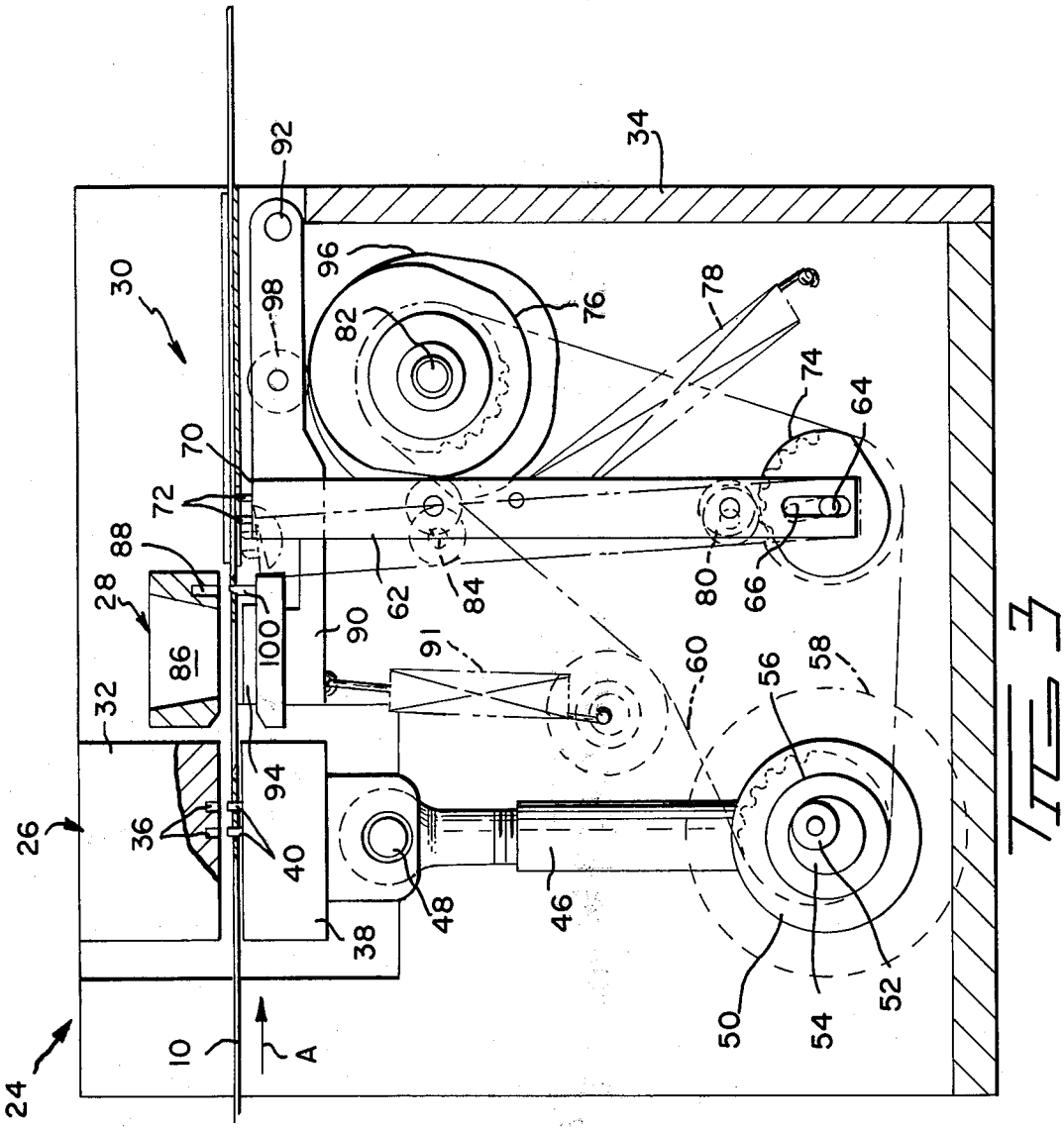

92
34
30
96
98
82
76
78
74
64
70
72
88
28
86
62
84
80
66
90
91
100
60
56
58
32
94
26
36
40
48
46
38
50
54
52
24
10
A

FIG. 4

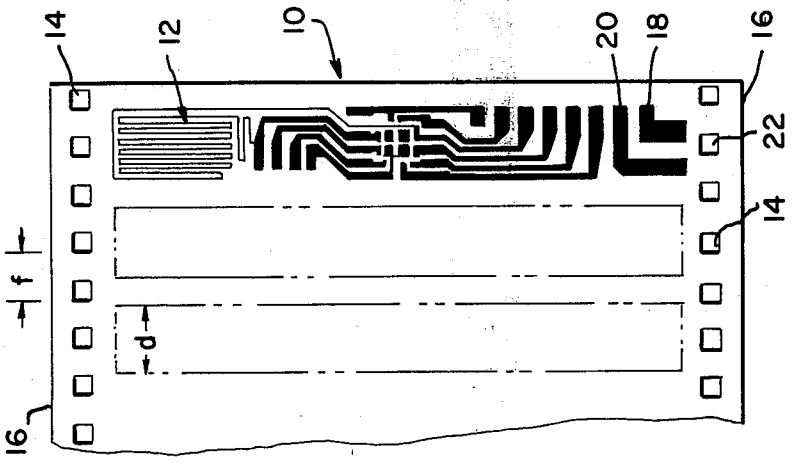

14
12
10
20
18
16
22
14
f
d
16

FIG. 1

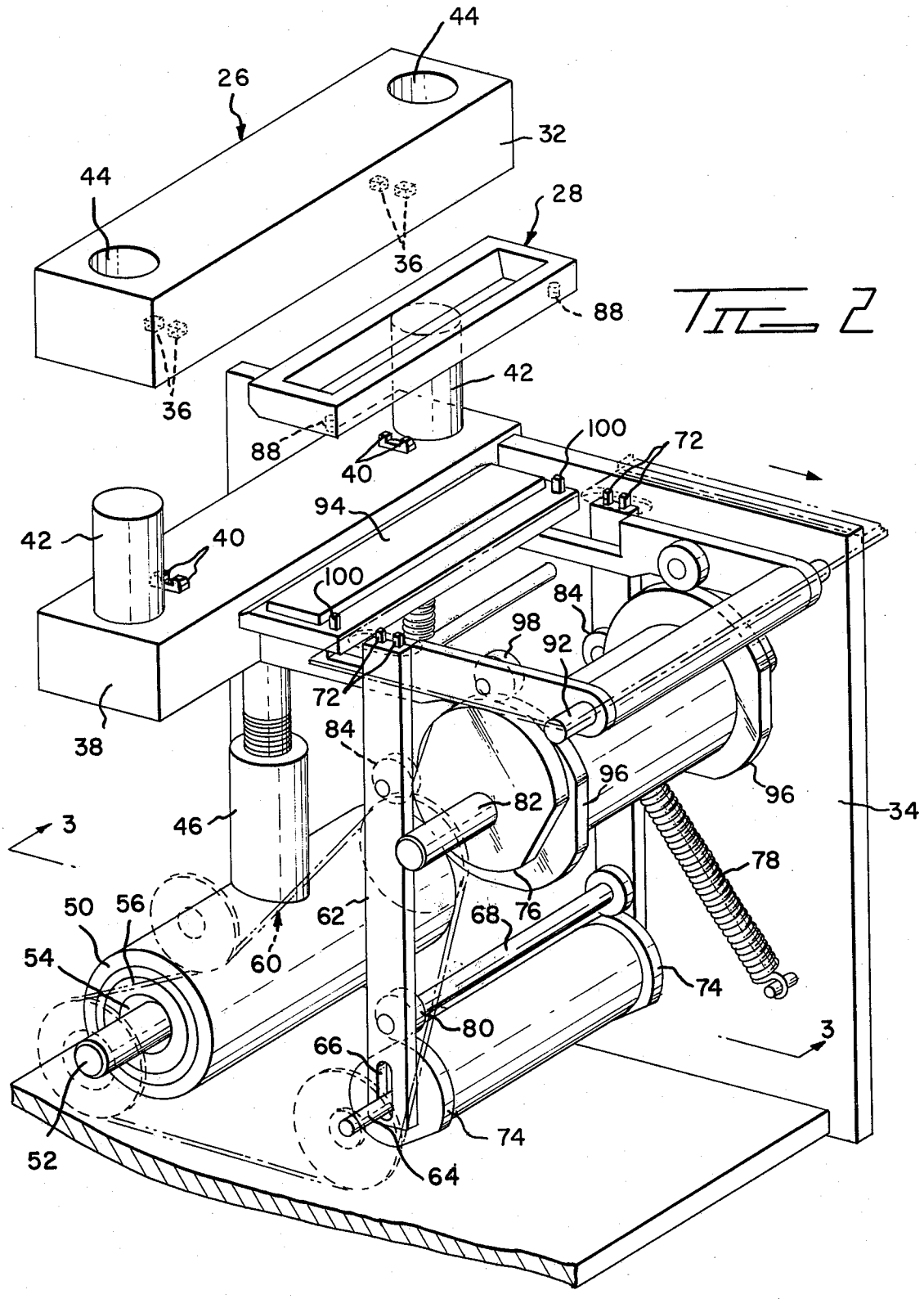

44
26
32
44
28
36
88
42
88
40
100
72
94
42
40
100
84
98
92
72
38
84
96
96
34
3
46
82
78
50
56
62
68
76
54
60
74
80
3
66
74
52
64

FIG 2

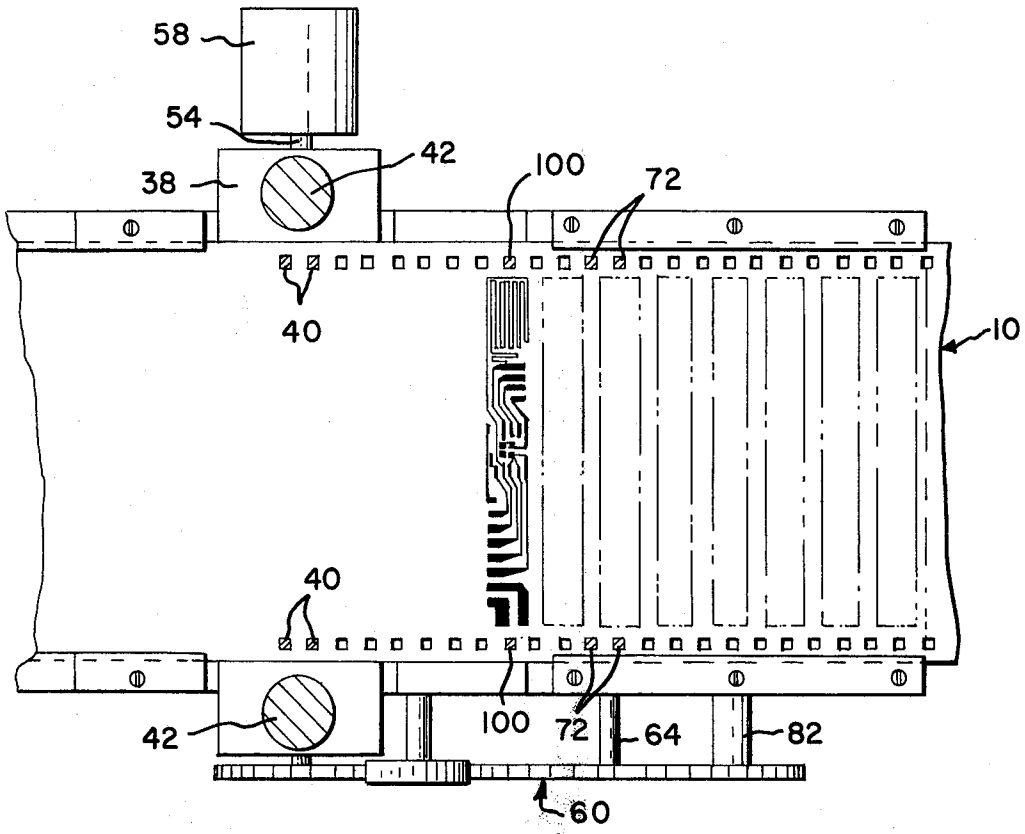


FIG. 4

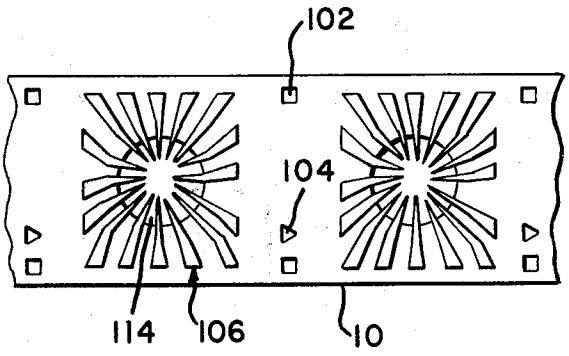


FIG. 6

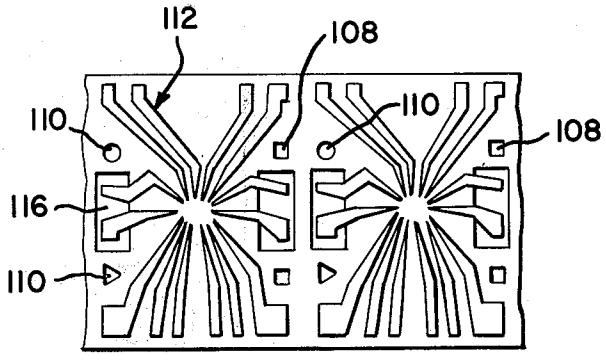


FIG. 7

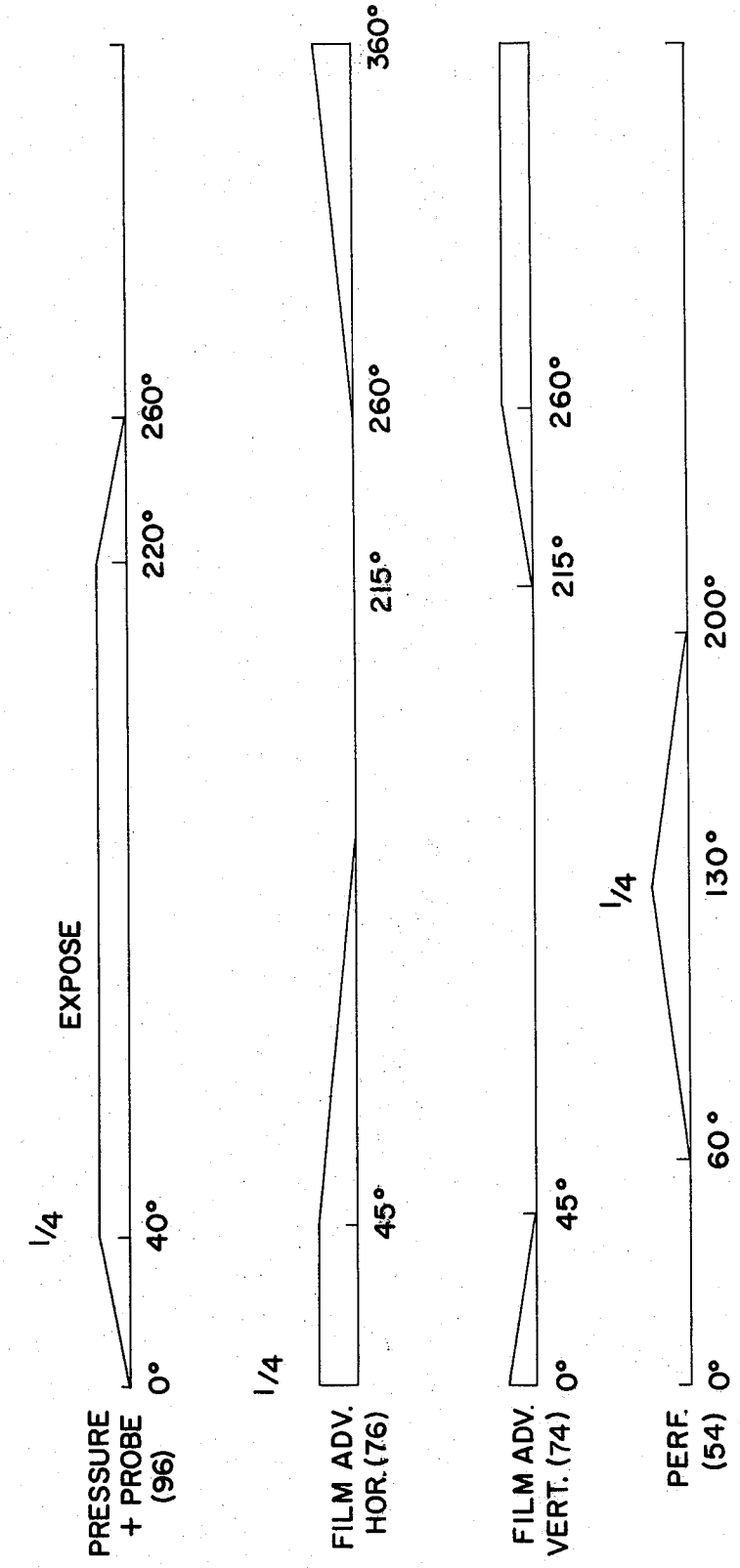

PRESSURE + PROBE (96)
1/4
0°
40°
EXPOSE
220°
260°
FILM ADV. HOR. (76)
1/4
45°
215°
260°
360°
FILM ADV. VERT. (74)
0°
45°
215°
260°
PERF. (54)
1/4
0°
60°
130°
200°

FIG 5

REGISTRATION DEVICE FOR PRINTED CIRCUITS

CROSS REFERENCE TO RELATED APPLICATIONS

The present application is a continuation-in-part of application Ser. No. 357,050 filed May 3, 1973, now abandoned.

BACKGROUND OF THE INVENTION

1. The Field Of The Invention

The present invention relates to the manufacture of printed circuits and the like and more particularly to a device for insuring precise printing or formation of a circuit on a flexible web with respect to apertures formed in the web.

2. Description Of The Prior Art

In the manufacture of printed circuits it is important to have the circuit precisely printed and located on the board or web. This is particularly important where the circuit is to be printed on flexible carrier webs which are subsequently used, or inserted, in electronic equipment for innerconnection with other components or circuits of such equipment. Typically, such flexible webs are provided with perforations or sprocket holes along the edges thereof, in the manner of motion picture film, with the perforations being used, in various electronic equipment, to locate the circuit printed on the web with respect to other electrical contacts formed in the equipment. Thus, it is imperative that the contacts of the printed circuit be in exact predetermined registry with perforations in the web so that these contacts match or line up with the contacts in the equipment in which the printed circuit is placed.

In previously proposed devices for forming printed circuits on a flexible carrier web the sprocket holes are formed in the manner of cinemagraphic film and the web is sequentially transported through a printing station wherein the conventional printing process takes place. Typically, the film is transported or guided through the printing station by sprocket rollers or the like at a predetermined speed in synchronism with the printing process, in an attempt to print each circuit at a predetermined location on the web with respect to the sprocket holes. However, in the formation of the sprocket holes there often is a slight error in the spacing between the adjacent perforations in the web. This error, over a long strip of web becomes cumulative and, as a result, each successive circuit printed on the web becomes increasingly misaligned with respect to the perforations or sprocket hole to which it should be in registry. The permissible error in locating a printed circuit with respect to a given sprocket hole or web perforation is normally ± 5 mils. Thus it is apparent that the accumulation of even a small spacing error in the perforations will ultimately create a substantial mismatch between each printed circuit and the perforation with which it is to be associated, so that the circuit will not lie within this range. As a result, many of the circuits which are printed cannot be used in the devices for which they are made.

SUMMARY OF THE INVENTION

In accordance with an aspect of the present invention a device is provided which is adapted to transport, in a step-by-step fashion, a flexible web through a station at which an electrical circuit is printed or formed on the web. The device includes a station adapted to perforate the web in any desired configuration. The transport mechanism includes a pair of associated lever arms, each of which has a plurality of pin means at its upper end for engaging sprocket holes formed in the flexible web. The lever arms are oscillated horizontally and vertically to transport the web through the device in predetermined increments. A clamping assembly is provided to operate in conjunction with the transport mechanism for clamping the flexible web in the printing station during that portion of the sequence of operation wherein the transport levers are not transporting or moving the web. The clamping assembly includes a pair of registration pins which are adapted to engage selected perforations in the web, at the printing station, and align these selected perforations with the art work or circuit to be printed on the web. More specifically, the registration pins are moved into the selected perforations in the web and thence engaged in recesses formed in predetermined locations in the printing head with respect to the circuit to be formed on the web. As a result, the circuit is always printed in exact registry, i.e., in exact spaced relation with respect to the selected perforations through which the registration pins extend.

Accordingly, it is an object of the present invention to produce a device for insuring exact registration of a circuit being formed on a flexible web with respect to selected perforations on that web.

Another object of the present invention is to provide a means for maintaining registration of a circuit formed on a flexible web with perforations in the web.

Yet another object of the present invention is to produce a device for maintaining printing registration in the formation of printed circuit boards which is relatively inexpensive and durable in construction.

A further object of the present invention is to increase the usable work surface of the web by locating the perforations between or within the circuits being printed rather than along the lateral edges of the film.

The above, and other objects, features and advantages of the present invention will be apparent in the following detailed description of an illustrative embodiment thereof which is to be read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a flexible web having a plurality of printed circuits formed thereon in predetermined spaced locations with respect to selected perforations along both lateral edges of the web;

FIG. 2 is an exploded perspective view of a device constructed in accordance with the present invention for printing the circuits in exact registry with selected perforations in a web;

FIG. 3 is a schematic side elevational view, taken along line 3—3 of FIG. 2;

FIG. 4 is a plan view of a flexible web, as it passes through the device illustrated in FIGS. 2 and 3, with the printed circuits formed thereon shown schematically;

FIG. 5 is a timing or dwell diagram for the cams of the subject apparatus;

FIG. 6 is a plan view, similar to FIG. 1, showing a first alternate arrangement of perforations of the web with the perforations being located between each occurrance of the printed circuit; and

FIG. 7 is a plan view, similar to FIGS. 1 and 6, showing a second alternate embodiment with the perforations in the web lying within the pattern of the circuit which is being printed thereon.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A flexible web **10** is shown in FIG. 1 with a plurality of printed circuits **12** formed thereon by the apparatus of the present invention. This web may be formed of any of the conventional materials on which printed circuits can be formed, for example, the web may be a photographic type film on which the circuit can be formed in a conventional photographic process or substrate of insulating material, such as Mylar or Kapton, which can be photoimaged.

The web **10** illustrated in FIG. 1 is of the cinemagraphic type and is provided with a series of perforations **14** along each of its lateral edges **16**, with the printed circuits **12** being located in predetermined spaced relationship with respect to the perforations. For example, in the printed circuit shown in FIG. 1 the circuit has contacts **18** and **20** which are located in predetermined relationship with respect to a selected perforation **22**. The circuit is used in an electronic device (not shown) which has other electrical connections formed therein in predetermined locations with respect to studs, pins or the like which are to be engaged with the selected perforations **22** of the flexible printed circuit board. More specifically, these pins are located to be engaged in the selected keying perforation **22** so that when the printed circuit board is placed in the electronic device, with a registration pin thereof passing through perforation **22**, the contacts **18** and **20** will be located in proper position with respect to the contacts in the electronic device. As a result, no special wiring or adjustment is required in locating the printed circuit board with respect to these other electrical contacts.

Referring now to the illustrative embodiment of the present invention, shown in FIGS. 2 to 5, the subject apparatus **24** includes a perforation station **26**, a printing station **28**, and a transport mechanism **30**. typically, the web **10** is supplied to the first station **26** from a roll or the like (not shown) and is transported through the apparatus from left to right as indicated by the arrow A in FIG. 2. If the circuit to be formed is rather narrow and the web fairly wide, than the web can be passed through a slitter to form several webs of the desired gauge feeding a parallel array of the subject apparatus. From perforating station **26**, where the perforations **14** are formed in the web, the web is advanced through a printing station **28** wherein the printed circuit **12** is formed on the web. The transport mechanism **30** is provided downstream of the printing station **28** for moving the web a predetermined distance after the completion of each printing step. The web with the circuit formed thereon would then be passed to conventional equipment (not shown) for either rolling and storing the web or to separate the individual circuits from the web prior to installation in associated electronic devices.

Perforating station **26** includes a head **32** fixedly mounted on a frame **34** of the apparatus in any convenient manner. This head is of conventional construction, as would be apparent to those skilled in the art, and includes pairs of apertures **36** located on opposite edges thereof vertically above the path of travel of web **10** as it passes through the apparatus. Located immediately below head **32**, and below the path of travel of the web, is a pin head **38** having two pairs of pins **40** secured thereto in vertical alignment with respect to apertures **36** in head **32**. Head **38** is mounted for vertical reciprocal motion in frame **34** by conventional means, such as pins **42** on head **38** engaging in bearing bores **44** in head **32**. The head **38** is driven by shaft **46** one end of which is attached to head **38** by pin **48** and the other end of which is rigidly connected to a collar **50** which surrounds an eccentric **52** fixedly mounted on a rotatable shaft **54**. Eccentric **52** is rotatably mounted within collar **50** by a bearing **56** in a conventional manner. The shaft **54** is driven by motor **58** also in a conventional manner.

Shaft **54** is driven by a motor **58** so that rotation of the shaft causes rotation of eccentric **52**, and as a result, vertical movement of pin head **38**. Rotation of shaft **54** is maintained in synchronism with respect to the other operating mechanisms of the apparatus, as described hereinafter, through its common chain and sprocket drive **60** (shown in phantom for the sake of clarity) with such other mechanisms from motor **58**. As a result, reciprocation of head **38** is timed so that perforations **14** are formed in web **10** simultaneously with the printing process occurring at station **28**, and while the web is stationary, i.e., when the transport mechanism **30** is not engaged therewith. Thus, at each stroke of head **38**, two perforations **14** are formed in each side of web **10**, (see FIG. 4) at perforating station **26**.

The web **10** is transported through the subject apparatus by the transport mechanism **30** which includes a pair of operating transport levers **62** which are respectively pivotally mounted on a drive shaft **64** extending transversely of the path of travel of web **10**. This is accomplished by the provision of slots **66** in the lower ends of levers **62**, through which slots the shaft **64** extends. It is noted that levers **62**, although driven in synchronism as described hereinafter, are operatively and rigidly connected for simultaneous movement by a cross-brace **68** or the like.

Transport levers **62** each include upper head portions **70** from which a pair of pins **72** project in predetermined spaced locations the spacing being equal to the spacing between successive perforations **14** along the edge of the web. As a result, pins **72** are adapted to enter pairs of perforations **14** for moving the tape along its path of travel.

The heads **70** of transport levers **62** are driven in a generally D-shaped path of travel (indicated by the dotted line in FIG. 3) by a pair of cams **74** and **76**. The levers **62** are biased into engagement with both of the cams by a pair of springs **78** secured, as seen in FIGS. 2 and 3, between the levers and rigid portions of the frame **34**, in any convenient manner. More specifically, two cams **74** are provided, each of which comprises a generally circular member rigidly mounted eccentrically on shaft **64** in position to cooperate with a roller type cam follower **80** rotatably mounted on its associated lever **62**. These cams effect vertical translation of levers **62** by moving the same vertically with respect to shaft **64** within the limits of slots **66**.

Cams **76**, on the other hand, are each generally circular cam members eccentrically mounted adjacent opposite ends of a shaft **82**. The latter is rotatably mounted in frame **34** in any convenient manner and the cams are positioned thereon to cooperate with roller

type cam followers **84** respectively mounted on levers **62.** These cams effect horizontal movement of heads **70** by pivoting the same about shaft **64.** Cams **74** and **76** are located in predetermined relation with respect to each other and are driven synchronously by motor **58** through the chain and sprocket drive **60.**

Cams **74** and **76** are positioned such that when cams **76** have rotated to a position wherein heads **70** are at their extreme left position, as illustrated by broken lines in FIG. **3,** then cams **74** are in position wherein their engagement with their associated cam followers **80** has moved heads **70** into a position wherein pins **72** are moving upwardly and are about to enter a pair of perforations **14** on opposite sides of web **10.** Because pins **72** are formed with inclined top surfaces, the pins can readily enter the perforations **14,** even if they are misaligned therewith, and thus be guided fully into the apertures until cams **74** have raised heads **70** to their fullest extent, wherein the base of pins **72** completely fill perforations **14.** As this is occurring, eccentric cams **76** are continuing to rotate so that their smaller eccentric portions move into engagement with their associated cam followers **84,** permitting springs **78** to draw levers **62** towards the right in FIG. **3.** As a result, web **10** is moved to the right in the drawing and is advanced, after a printing step, as described hereinafter. Ultimately, levers **62** reach their extreme right position, illustrated in solid lines in FIG. **3** of the drawing, wherein a smaller portion of cam **76** is engaged with roller **84.** At that position, pins **72** of the head are just leaving their engagement with the perforations **14,** as a result of the positioning of cams **74** on shaft **64.** Thus, the pins are withdrawn from the tape as heads **70** reach their rightmost position.

Continued rotation of cams **74** and **76** cause heads **70** to move downwardly to the left, and thence to begin to rise towards the dotted line position thereof shown in FIG. **3** wherein the pins are in position to engage the next pair of apertures **14.** As a result, it is seen that transport mechanism **30** is adapted to transport the web in a step-by-step fashion a distance substantially equal to the distance between alternate pairs of perforations in the tape during each step.

It is to be understood that the construction of the illustrative embodiment of the invention can be varied, to cause the web **10** to move at selected varying distances during operation of the device by properly providing appropriately sized cams. In this connection, it is contemplated that the distance the web is transported in each step will be a function of the width dimension of the printed circuit being formed on the web **10.** In the illustrative embodiment of the invention the printed circuit has a width dimension equal to the distance between alternate perforations, i.e., the total width "*d*" is equal to the width of a single perforation **14** plus the length of the unperforated portions of the web on opposite sides thereof. Thus, it is only necessary in the illustrative embodiment to advance the web this distance *d* plus the distance *f* between successive circuits. Where the width of the circuit is greater than *d*, then heads **70** and cams **74** and **76** are modified to permit the advance of the tape along that greater distance.

In any case, during movement of heads **70** from their solid line position to their dotted line position, i.e., between movements of the web **10,** the formation of the printed circuit on the web takes place at station **28.** As mentioned, the particular process used to form the circuit on the web **10** can be any of the various known processes presently available. In particular, the photographic process may be used if desired. Typically, printing station **28** is provided with a printing head **86** which contains the master art work of the printed circuit to be formed on the web, i.e., it can be contain a copper cylinder or a photographic negative of the circuit board to be printed. The head is located directly above the path of travel of web **10** as it passes through the apparatus, as illustrated in FIGS. **2** and **3,** and includes a pair of recesses **88** (only one of which is seen in the side view of FIG. **3**) located directly above the perforations **14** formed along the opposite edges of the web **10.**

A clamping lever **90** is located immediately below head **86** at printing station **28,** with the lever being pivotally mounted in frame **34** by a pivot pin **92** or the like. The clamping lever includes a resilient clamping pad **94** which is adapted to urge the web **10** into contact with the printing head **86** during the printing process upon pivotal movement of the lever **90** in a generally clockwise direction, as seen in FIG. **3,** against the biasing force of springs **91.** Lever **90** is pivoted in this direction by a pair of cams **96,** mounted on shaft **82.** Cams **96** are each generally circular members eccentrically mounted at opposite ends of shaft **82** and positioned to be engaged with roller type cam followers **98** mounted on opposite sides of levers **90.** Cams **96** are also located in a predetermined position with respect to cams **74** and **76** such that the smaller eccentric portions thereof are engaged with their associated rollers **98** when levers **62** are moving between their dotted line position to their solid line position, i.e., during the transport of the web. As the levers **62** return to their dotted line position, cams **96,** because of the eccentric mounting thereof on shaft **82,** have their larger eccentric portions engaged with cam followers **98,** thereby causing levers **90** to pivot in a clockwise direction to engage pad **94** with web **10** against printing head **86.**

In order to insure precise registration of the apertures **14** with respect to the art work in printing head **86,** a registration pin **100** is provided on each side of lever **90,** as illustrated most clearly in FIG. **2.** Pins **100** are located directly below recesses **88** in head **86** so that as lever **90** moves in a clockwise direction towards head **86,** pins **100** enter the perforations **14** in web **10,** directly thereabove, and thence enter the recesses **88.**

It is noted that the upper end portions of pins **100** may be tapered, so that they can readily enter perforations **14** and guide the same down to the main shank portion of the pins. These shank portions of the pins have a configuration in plan corresponding to the generally configuration of the perforations in web **10.** As a result, web **10** will be moved into exact mating relation with pins **100,** thereby registering the perforations with respect to the pins. As the pins enter the recesses **88** in printing head **86** (which recesses have a generally complementary configuration with respect to pins **100**) the pins, and thus the perforations **14,** are positioned in exact registration with respect to the art work to be printed on the web. The printing process then occurs, i.e., the photographic film negative is exposed and thus the printing circuit is formed in its exact desired location on the web with respect to the perforations **14.**

As cam **96** is continuously rotating under the influence of motor **58,** lever **90** ultimately moves downwardly in a counterclockwise direction, disengaging

pins **100** from perforations **14.** As these pins disengage perforations **14,** pins **72** on levers **66** enter perforations **14** downstream of the printing station to move the web forward, to the right in FIG. **3.** The process continues in this manner until the desired number of printed circuits is formed on web **10.**

As a result it is seen that a relatively simple device is provided in which printed circuits are formed on a web in exact predetermined locations with respect to perforations formed in the web. The transport mechanism **30** moves the web in step-by-step fashion between printing cycles and maintains a relatively precise registration between the apertures **14** and the art work and the printing head **86** because the configuration of cams **74** and **96** is such that the web is transported a distance substantially equal to the dimensions of the art work. However, at each printing cycle pins **100** provide exact registration of the art work with respect to the adjacent perforations. Thus, extremely fine registration of the printed circuits with respect to the apertures is obtained.

The above discussed timing relation of the several cams is graphically illustrated in FIG. **5.** It will be noted from this diagram that the perforation and printing steps take place while the web is momentarily stopped and that both the perforation and printing heads are moved out of control with the web prior to a further forward movement of the web.

The foregoing embodiment has been shown and described with the resulting web having a final configuration which is quite like conventional cinimagraphic film. However, it is not necessary to have perforations at both lateral edges of the web. In fact, it may be preferable not to have the perforations so located since this configuration results in a substantial loss of usuable area on the web. This loss is as high as **33.3** percent for a **16** mm wide web, **14.9** percent for a **35** mm web and **5.8%** for a **70** mm web.

It is within the scope of this invention to eliminate the above mentioned waste by having transport perforations **102** and locating perforations **104** formed in the web **10** between adjacent circuits **106,** as shown in FIG. **6,** or to have transport perforations **108** and locating perforations **110** formed in the web **10** to lie within the pattern of the circuit **112,** as shown in FIG. **7.** It should also be noted that these perforations need not be simple rectangular openings. They can be coded perforations of almost any geometric configuration and in almost any pattern. It should also be noted that apertures, such as **114** and **116,** can be formed for cantilever beam circuits simultaneously with the transport and locating apertures simply by adding an appropriate punch and recess in heads **32** and **38.**

Although an illustrative embodiment of the present invention has been described herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to that precise embodiment and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of this invention.

What is claimed is:

1. A device for printing a predetermined pattern on a web having perforations formed therein in predetermined spaced locations, said device including:

a printing station, means at said printing station for sequentially printing said predetermined pattern on said web, spaced recesses formed in said printing means located in predetermined spaced relation to the pattern to be printed thereby, clamping means movably mounted in said device on the opposite side of said web from said printing means, means for moving said clamping means into and out of engagement with said printing means during each printing operation, said clamping means including pins extending therefrom towards said recesses in said printing means, said pins, perforations and recesses all having a complementary configuration in plan, said pins passing through perforations in said web into said recesses, as said moving means moves said clamping means into engagement with the web, whereby the perforations receiving said pins are located in alignment with said recesses and positioned in a predetermined relation with respect to the pattern being printed on the web; and

means for advancing said web through said printing station a predetermined distance between each printing operation comprising at least one advancing head movably mounted in said device downstream of said printing station in the direction of travel of the web, said advancing head having at least one tooth extending therefrom in position to selectively engage perforations in said web, and means for moving said advancing head in a generally D-shaped path of travel wherein at an initial position said teeth engage perforations in the web after a printing operation and are moved away from the printing station for a predetermined distance at the end of which the teeth are disengaged from said perforations and the heads are returned, out of engagement with the web, toward the printing station, during the printing operation, to said initial position, whereby said web is advanced in a step-wise manner over a predetermined distance between printing operations.

2. The device as defined in claim **1** wherein said pins have free end portions which are received in said recesses, said free end portions being tapered to thereby initially guide said pins through the perforations in the web and adjust the position of the web to locate the perforations therein in alignment with the remaining portions of the pins.

3. The device as defined in claim **1** wherein said advancing means comprises a pair of spaced advancing heads movably mounted in said device downstream of said printing station in the direction of travel of the web, said advancing heads being positioned in spaced relation to each other along opposite sides of the path of travel of the web.

4. The device as defined in claim **3** wherein said clamping member is pivotally mounted in said device and said advancing heads each include lever members pivotally mounted in said device, said means for moving said clamping means and said means for moving said advancing heads comprising a plurality of rotating cams respectively operably associated with said clamping member and said levers for pivoting the same about their respective pivotal mountings.

5. The device as defined in claim **1** further including means for forming said perforations in the web, said perforation means lying upstream of said printing station in the direction of travel of said web.

6. The device as defined in claim **1** wherein said printing means comprises means for forming a printed electrical circuit on said web.

7. A device for forming a predetermined pattern on a flexible web in predetermined positions with respect to spaced perforations formed in said web, said device comprising, a pattern forming station, pattern forming means at said station for sequentially forming said predetermined pattern on said web, means for advancing perforated web through said station a predetermined distance between each pattern forming operation, said pattern forming means having at least one recess formed therein located in a predetermined position with respect to the pattern to be formed thereby and in general alignment with the path of travel of the perforations on the web,

clamping means movably mounted in said device on the side of the path of travel of said web opposite said pattern forming means and means for moving said clamping means into and out of engagement with said pattern forming means during each forming operation, said clamping means including at least one pin means extending therefrom towards said pattern forming means and being aligned with said recess, said pin means being adapted to selectively engage perforations in said web and enter said recess, as said moving means moves said clamping means into engagement with the web, to thereby locate said web with respect to said recess and the predetermined pattern being formed on the web; said pin means, perforation and recess all having a complementary configuration in plan; said pin means having a free end portion which is received in said recess, said free end portion being tapered thereby initially to guide said pin means through the perforations in the web and adjust the position of the web to locate the perforations therein in alignment with the remaining portions of the pin; and including means upstream of said pattern forming station in the direction of travel of said web for forming said perforations in the web.

8. A device according to claim 7 wherein said pin means, said recess and said perforations are aligned with at least one lateral edge of said web.

9. A device according to claim 7 wherein said pin means, said recess and said perforations are aligned substantially transversely of said web between the individual patterns thereon.

10. A device according to claim 7 wherein said pin means, said recess and said perforations lie at least partially within each individual pattern on said flexible web.

11. A device for forming a predetermined pattern on a web having perforations formed therein in predetermined spaced locations, said device including:

a pattern forming station, means at said pattern forming station for sequentially forming said predetermined pattern on said web, said pattern forming means having a pair of spaced recesses formed therein located in predetermined spaced relation to the pattern to be formed thereby, said recesses being spaced from each other a distance equal to the distance between perforations in the web; clamping means movably mounted in said device on the opposite side of said web from said pattern forming means and means for moving said clamping means into and out of engagement with said pattern forming means during each forming operation, said clamping means including pin means extending therefrom towards said pattern forming means and being spaced from each other a distance equal to the distance between said recesses, said pin means passing through the perforations in said web into said recesses as said moving means moves said clamping means into engagement with the web, whereby the perforations receiving said pins are located in alignment with said recesses and positioned in a predetermined relation with respect to the pattern being formed on the web; said pins, perforations and recesses all having a complementary configuration in plan; said pins having free end portions which are received in said recesses, said free end portions being tapered to thereby initially guide said pins through the perforations in the web and adjust the position of the web to locate the perforations therein in alignment with the remaining portions of the pins;

perforation means upstream of said pattern forming station in the direction of travel of said web for forming a spaced pattern of perforations in the web; and

advancing means downstream of said pattern forming station for advancing the perforated web through said device a predetermined distance between each printing operation.

12. The device according to claim 11 wherein said pattern forming station further includes printing means.

13. The device according to claim 11 wherein said pattern forming station further includes photoimaging means.

14. The device according to claim 11 wherein said pattern to be formed is an electrical circuit.

15. The device according to claim 11 wherein said pins, perforations and recesses have a configuration extending transversely of said web between adjacent patterns formed thereon.

16. The device according to claim 11 wherein said pins, perforations and recesses have a configuration lying at least partially within the patterns formed on said web.

* * * * *