Nov. 1, 1960 W. P. SHAW ET AL 2,958,126

METHOD AND APPARATUS FOR THREADING PERFORATED ARTICLES

Filed Oct. 4. 1956 4 Sheets-Sheet 1

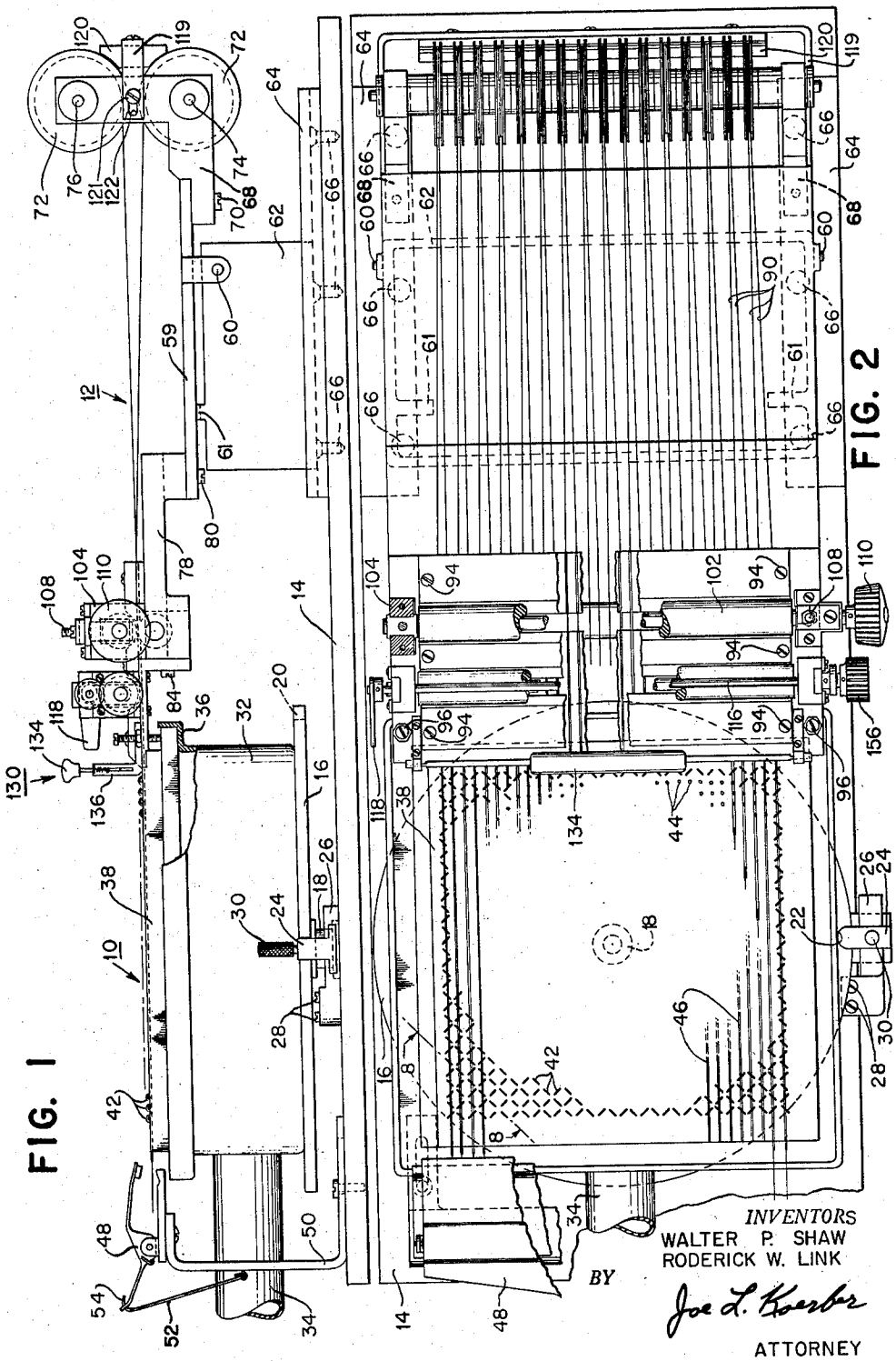

FIG. 1

FIG. 2

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METHOD AND APPARATUS FOR THREADING PERFORATED ARTICLES

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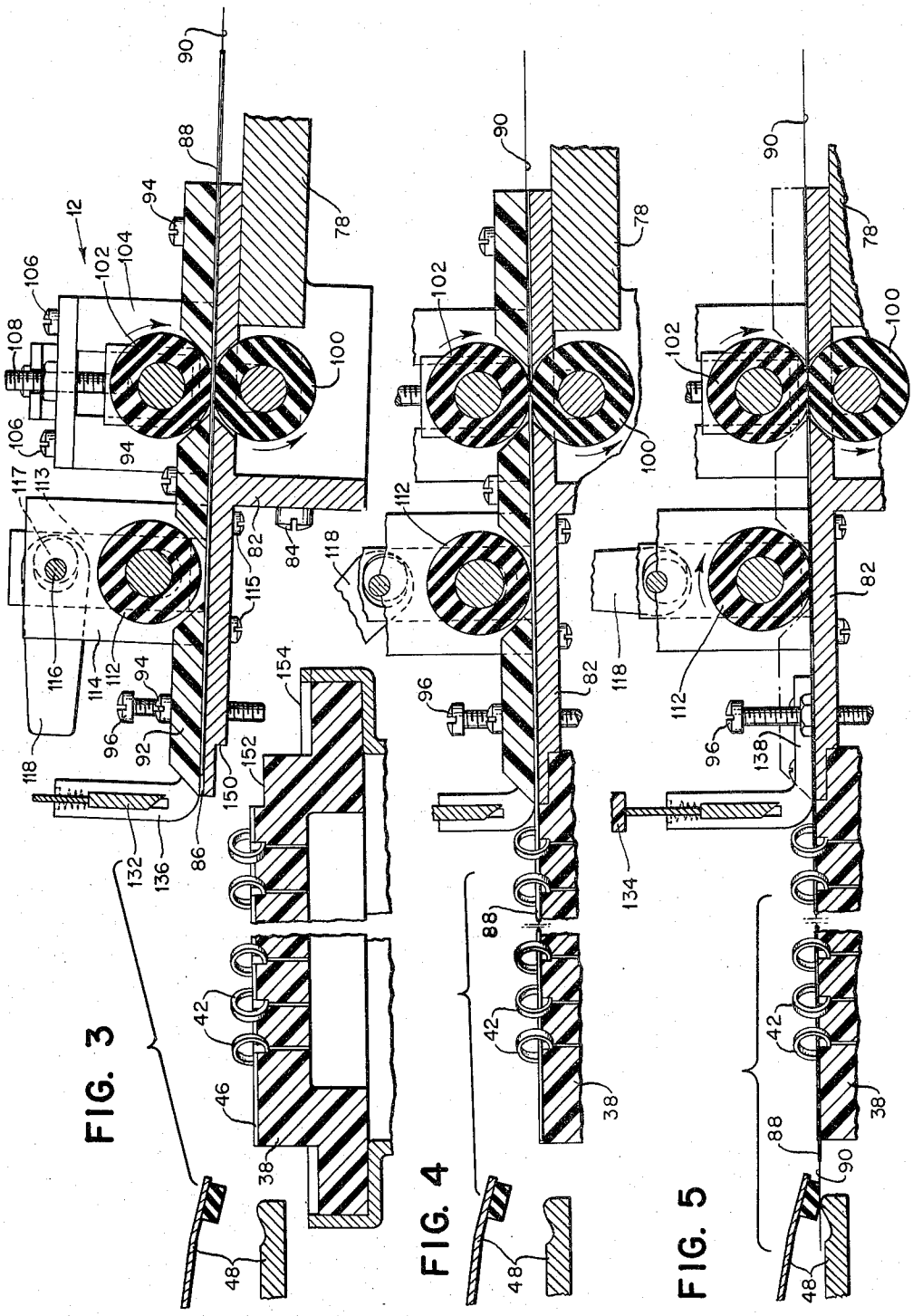

FIG. 3

FIG. 4

FIG. 5

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METHOD AND APPARATUS FOR THREADING PERFORATED ARTICLES

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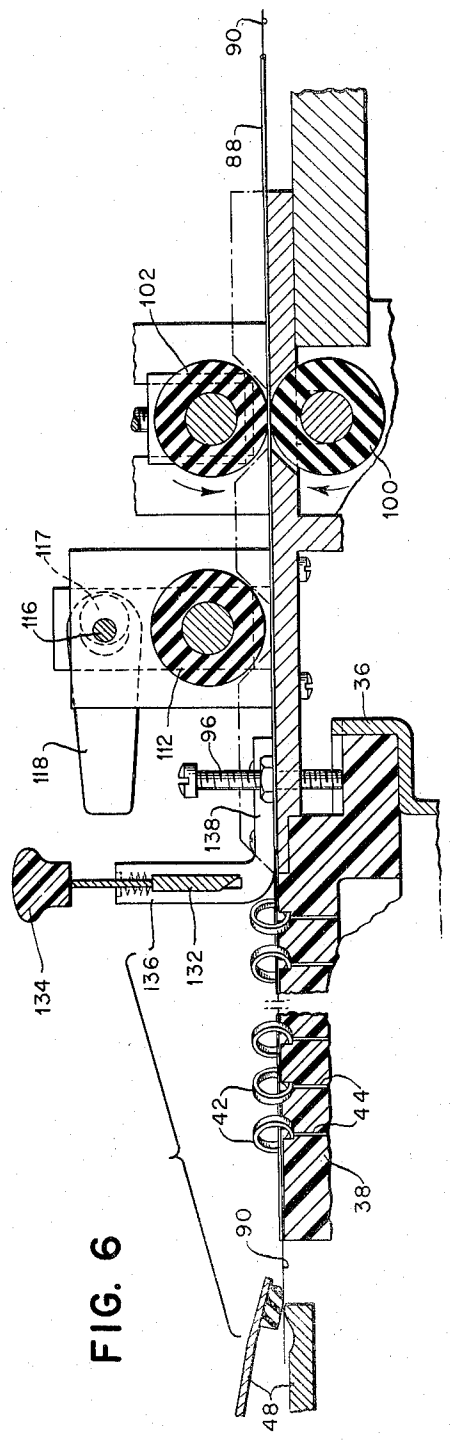

FIG. 6

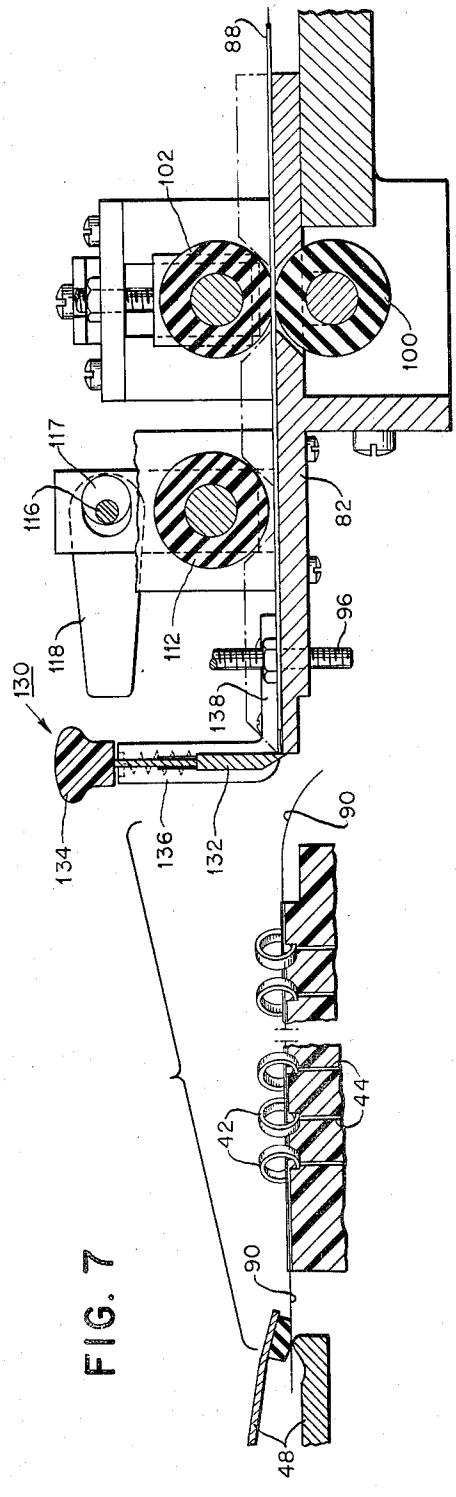

FIG. 7

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METHOD AND APPARATUS FOR THREADING PERFORATED ARTICLES

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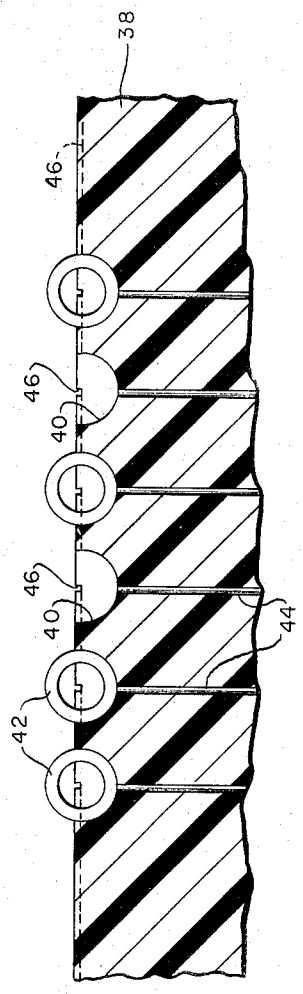

FIG. 8

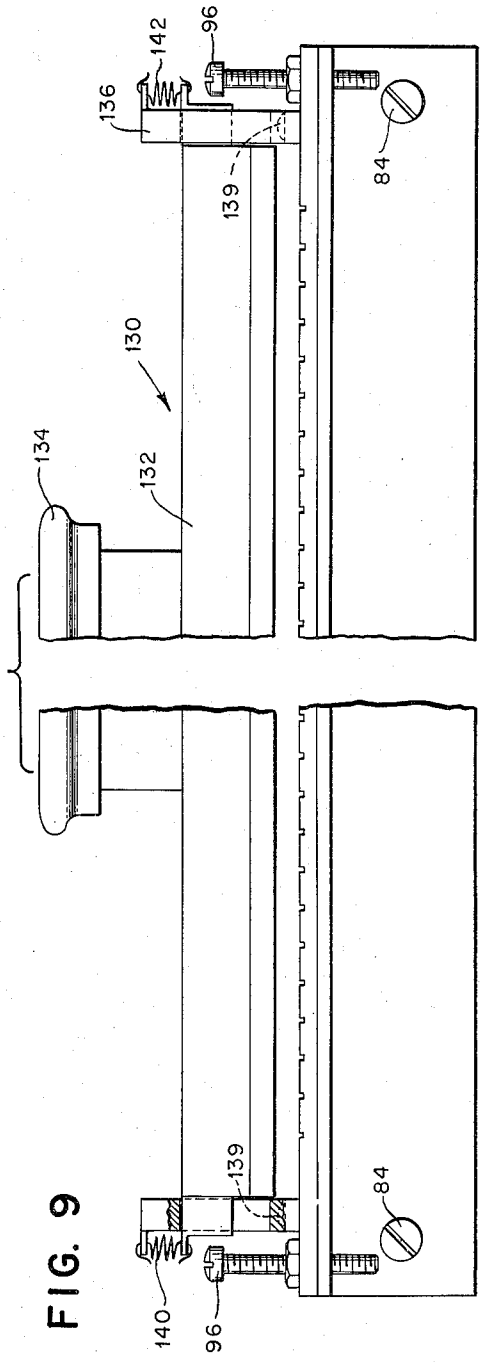

FIG. 9

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2,958,126

METHOD AND APPARATUS FOR THREADING PERFORATED ARTICLES

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8 Claims. (Cl. 29—433)

This invention relates to a device for threading pierced articles on a line and more particularly to a device in which the line is threaded by means of a hollow needle-like tube.

In the past the operation of threading wires through magnetic cores has been largely a manual operation where the wires are fed through individual cores using tweezers. Aligned rows of cores have been threaded by passing a hooked needle through the cores and then withdrawing it with a wire attached or by attaching a wire first and then passing the needle through the cores and drawing the wire through after the needle.

The known methods of threading wires through cores are too slow and tedious and subject to error. The present device is designed to obviate some of the difficulties previously encountered in the threading of perforated articles.

In accordance with the foregoing observations, the main object of this invention is to provide an improved method and device for inserting wires in rows of pierced articles, for example, magnetic cores.

Another object of the invention is to provide a device for simultaneously inserting a plurality of wires into a plurality of parallel rows of pierced articles.

Still another object of the invention is to provide a device for first inserting one or more sets of wires into cores aligned in rows in one direction and then inserting one or more wires into rows of the cores aligned in another direction.

A further object of the invention is to provide a core threading device utilizing hollow needles by means of which the needles are threaded through cores after which the wires are driven through the needles and held while the needles are withdrawn thereby leaving the cores threaded by wires.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated of applying that principle.

In the drawings:

Fig. 1 is a side elevation.

Fig. 2 is a plan view with parts broken away to show details.

Figs. 3–7 are fragmentary views illustrating various stages of operation of the device.

Fig. 8 is a section taken along line 8—8 in Fig. 2, and illustrates details of a core holder.

Fig. 9 is a view of a wire cutter.

Referring to Figs. 1 and 2, the device comprises generally, a vacuum box and core support unit **10** and a needle unit **12** both mounted on a base plate **14**. The unit **10** comprises a turntable **16** pivotally mounted on the base plate **14** by a spindle **18**.

Notches **20** and **22** are provided in the turntable **16**, ninety degrees apart, for locking the turntable selectively in two positions by means of a detent **24** slidably mounted on a bracket **26** fixed to the base plate **14** by screws **28**

and biased into engagement with a notch **20** or **22** by a spring (not shown). The detent **24** is operated by a handle **30**.

A vacuum box **32** is fixed in a centered position on the turntable **16**, and is connected to a vacuum producing device (not shown) by a hose **34**. A flange **36** is provided on the box **32** to receive and hold a core support member **38**. Suitable material, for example sponge rubber, may be placed between the flange **36** and the support member **38** to provide a suitable vacuum seal.

Referring to Fig. 8, which is a section view taken along the line 8—8 Fig. 2, the details of the core support member **38** are illustrated. Six cavities **40** are shown, four of which contain magnetic cores **42**. Each cavity has a vacuum port **44** extending from its lowermost point through a support **38** to the bottom side. The support **38** forms a lid for the vacuum box **32** and the vacuum is applied to the ports **44** and serves to hold the cores **42** within their respective cavities **40**. A sheet of transparent electrostatic material (not shown) of the type commonly used as a self-sealing wrapper for foods and other items, may be placed over the cores in the support **38** to be acted upon by the vacuum and aid in holding the cores in place. Grooves **46**, intersecting rows of cavities **40** in one direction only are provided as shown in Figs. 2 and 8. In Fig. 2, the support member **38** is shown partially filled with cores **42** which, it will be noted, are arranged at angles of ninety degrees to adjacent cores. A few vacuum ports **44** are indicated in Fig. 2. It will be understood that the cavities **40** with their ports **44** are uniformly distributed over the core support member **38**, but, for ease of illustration, some have been omitted in Fig. 2.

Referring again to Figs. 1 and 2, a spring biased wire gripper **48** is mounted on the base plate **14** by a bracket **50**. The gripper **48** may be latched in an open position by a latch member **52** mounted on the bracket **50** and engageable with the gripper **48** at a point designated **54**. To close the gripper **48**, it is necessary only to release the latch **52**.

The needle unit **12**, shown in Figs. 1 and 2, includes a plate **59** pivoted at **60** on a frame member **62** which is slidably mounted in ways **64** fixed to the base plate **14** by screws **66**. A bracket **68** fixed to the plate **59** by screws **70** (one shown) rotatably supports a plurality of wire spools **72** on shafts **74** and **76**.

The needle feeding mechanism is mounted on a bracket **78** fixed to the plate **59** by screws **80** (one shown). The needle feeding mechanism is shown in greater detail in the sectional view, Fig. 3. A T-shaped bracket **82** is fixed to the bracket **78** by screws **84** (one shown). The upper surface of the bracket **82** contains a plurality of parallel grooves **86** for receiving hollow needles **88** through which wires **90** from the spools **72** are threaded. A transparent plate **92**, for example Lucite, is fixed to the T-bracket **82** by screws **94** to retain the needles **88** in the grooves **86** and to permit viewing the needles for a purpose described hereinafter.

A pair of adjusting screws **96** (one shown in Fig. 3) are provided in the T-bracket **82** for adjusting the needle unit **12** for vertical alignment with the cores **42** in the core support member **38**.

A roller **100** is rotatably mounted in the bracket **78** and a roller **102** is mounted thereabove by brackets **104** and screws **106** and is made vertically adjustable by adjusting the screws **108**. The rollers **100** and **102** are operated by an operating knob **110** (Fig. 2) fixed to the shaft of the roller **102**. A braking roller **112** is rotatably mounted in a pair of blocks **113** (Fig. 3) slidably mounted in brackets **114** fixed to the T-bracket **82** by screws **115**. A shaft **116**, Figs. 2 and 3, carries eccentric cams **117**, Fig. 3, engaging the blocks **113**. A brake handle **118** is

fixed to one end of the shaft **116**, and when moved to the position of Fig. 4, cams the roller **112** into driving engagement with the needles **88**; when further moved to the position of Fig. 5, the roller **112** is cammed into a position where the needles are locked against the T-bracket **82**.

Referring to Fig. 1, a brake is shown mounted on the bracket **68** by means of a bracket **119**. The brake includes a brake shoe **120** which may be rubber or any suitable material. The bracket **119** is fixed to the bracket **68** by screws **121** and slots **122** (one each shown in Fig. 1). By adjustment of the bracket **119** on the bracket **68**, the shoe **120** may be set to clear the spools **72** or to engage them depending upon whether braking of the spools is desired. The shoe **120** may be adjusted to engage the wire spools **72** with sufficient friction to hold the wires while the needles are fed by the rollers **100** and **102**. The needles may be fed without braking the spools if the ends of the wires **90** do not protrude from the leading ends of the needles **88**. This may be accomplished by retracting the wires inside the needles by manipulation of spools **72**.

A wire cutting device, best shown in Figs. 7 and 9, is generally designated **130** and comprises a knife blade **132** having an operating handle **134**. The blade **132** fits slidably in a bracket **136** having a flange **138**, Fig. 7, by which the bracket **136** is affixed to the T-bracket **82** by the bolts **139**. The blade **132** is retained in a raised position by springs **140** and **142** connected with the blade **132** and the bracket **136**. The knife blade **132** cooperates with an edge **144** of the T-bracket **82** for cutting the wires **90**.

Operation

A complete operation including the threading of coordinate wires in two directions through the cores in the core support will now be described.

A core support member **38** completely filled with cores **42** (for example, 4096 cores comprising 64 rows by 64 rows) and preferably covered with the aforementioned transparent electrostatic sheet, is inserted in the vacuum box **32** and vacuum is applied thereto through the hose **34**. The turntable **16**, initially is rotated ninety degrees clockwise from the position shown in Fig. 2 and is latched in that position by the detent **24** and the notch **20**. The brake arm **118** is in the released position of Fig. 3 and the gripper **48** is latched open.

Referring to Figs. 1 and 3, the upper portion of the needle unit **12** is pivoted clockwise about the pivot **60** and is moved toward the vacuum unit **10** on the ways **64**. The needle unit is lowered onto the vacuum unit with a notch **150**, Fig. 3, engaging a step **152** and with the vertical adjusting screw **96** resting on a surface **154** of the support member **38**. The needle grooves **86** are horizontally aligned with the rows of cores **42** and are vertically aligned for the needles **88** to clear the top surface of the support member **38**. The knob **110**, Fig. 2, is rotated clockwise and the needles **88** are fed from a position where the left ends of the needles are just inside the needle grooves **86** to a position where the right ends of the needles are observed to be passing under the roller **102**. During this feeding operation, the spools **72** are braked as described hereinbefore and the needles are fed through the rollers **100—102**. Full feeding of the needles leaves the ends of the wires inside the needles **88** through which they may then be fed as described hereinafter. An alternative method is to remove the effect of the brake shoe **120** whereby there is sufficient friction between the wires and the needles that the wires unwind from their respective spools under the pull exerted by the needles.

Before the needles **88** are fed from between the rollers **100—102**, the brake arm **118** is rotated to the position shown in Fig. 4 in which position the roller **112** is brought into engagement with the needles **88** to apply a slight braking effect to stop the needles immediately after they pass from between the rollers **100—102**. But for the brake, the needles **88** might be fed further than desired due to the frictional connection between the wires and the needles and the driving effect of the rollers **100—102** on the wires **90** when the needles **88** leave the rollers. The needles **88** are then fed beyond the rollers **100—102**. After the needles leave the rollers, the brake arm **118** is rotated to the locking position (Fig. 5) moving the roller **112** to a position where the needles are locked against the T-bracket **82**. The wires **90** at this time are in engagement with the rollers **100** and **102**. The clockwise rotation of the knob **110** is continued and the wires **90** are fed through the needles **88** whereby they protrude from the left ends of the needles and into the jaws of gripper **48**. The gripper **48** is released to grip the wires **90** as shown in Fig. 5. The brake handle **118** is returned to the slight braking position and a knob **156** fixed to the shaft **116**, Fig. 2, is rotated counterclockwise to feed the needles **88** back under the roller **102**. The knob **110** is then rotated counterclockwise to retract the needles to their original positions (Fig. 6) while the gripped wires **90** remain in their threaded position in the rows of cores. When the needles **88** have been fully retracted, the needle unit **12** is moved on its ways **64** away from the vacuum unit **10** (Fig. 7) thereby paying out more wire. The wire cutter **130** is operated to clip the wires **90** off at the cutting edge **144**. The gripper **48** is released; the detent **24** is withdrawn from the notch **20**; the turntable **16** is rotated ninety degrees and the detent **24** is engaged with the notch **22**. It is necessary to move the unit **12** away from the unit **10** to provide clearance for rotation of the turntable **16**.

The needle unit **12** is again moved toward the vacuum unit **10** on the ways **64** and lowered into place upon the support member **38**. The needle grooves **86** and needles **88** must be vertically and horizontally aligned with the grooves **46** in the support member **38**. The vertical alignment may be accomplished by having the step **152** and surface **154** at a slightly lower level on the side adjacent the needles in the rotated position of the turntable **16** or by adjustment of the adjusting screws **96**.

With the units **10** and **12** so aligned, the needle and wire feeding procedure described hereinbefore is repeated, feeding wires **90** through the grooves **46**, under the first inserted wires **90** and at ninety degrees thereto. After the needles have been retracted and the wires **90** clipped off, the core support member **38** is removed from the vacuum box **32** and the ends of the wires **90**, now threaded through the rows of cores, may be secured to any suitable support and terminals. After such securing and removal of the cores, the support member **38** may be refilled with cores for repeated use.

Following the described procedure, several parallel wires may be inserted, one at a time, in each row of cores.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A device for threading coordinate filaments in an array of perforated elements comprising, in combination, means for supporting a plurality of said elements aligned in first parallel rows and in second parallel rows intersecting said first parallel rows, each said element being common to two said intersecting rows and said perforation of each said element being aligned with all perforations of both said common rows, a plurality of tubular elements, one for each said first parallel rows, alignable

with said first parallel rows, means for rotating said support means for aligning said second parallel rows with said tubular elements, means for supplying a continuous filament corresponding to each said tubular element, having one end frictionally engaged therein, a pair of first rollers initially engaging said tubular elements and operable for feeding said tubular elements, together with said filaments, completely through said first rollers into said parallel rows of aligned perforations, operable for thereafter feeding said filaments through said tubular elements and for thereafter retracting said tubular elements, a second roller lockable for holding said tubular elements and operable for thereafter retracting said tubular elements into said first rollers, a brake for locking said second roller against said tubular elements, means for holding said filaments during said retracting operation and means for cutting said filaments intermediate said support means and said rollers.

2. A method of threading coordinate filaments in an array of perforated elements comprising the steps of supporting a plurality of said elements aligned in at least two intersecting rows, one said element being common to said two intersecting rows and said perforation in said one element being aligned with all perforations of both said common rows, aligning a tubular element containing one end of a filament and a first one of said intersecting rows of elements, feeding said tubular element together with said filament into said aligned perforations, feeding said filament to project the end of said filament from said tubular element, holding said filament end, retracting said tubular element, severing said filament near the end of said retracted tubular element, aligning said tubular element and a second one of said intersecting rows, feeding said tubular element together with said filament into said aligned perforations of said intersecting row, again feeding said filament to project the end of said filament from said tubular element, holding said filament end, retracting said second tubular element and severing said filament near the end of said tubular element.

3. A device for threading coordinate wires in an array of perforated elements comprising, in combination, means for supporting a plurality of said elements aligned in first parallel rows and in second parallel rows intersecting said first parallel rows, each said element being common to two said intersecting rows, said perforation of each said element being aligned with all perforations of both said common rows and said support means containing grooves in alignment with said openings of said second rows, a plurality of hollow needles, one for each said first parallel row, alignable with said perforations of said first parallel rows, means for rotating said support means for aligning said grooves and aligned perforations of said second rows with said needles, means for supplying a continuous wire corresponding to each said needle, one end of said wire being frictionally engaged within a corresponding one of said hollow needles, a pair of first rollers initially engaging said needles and operable for feeding said needles, together with said engaged wires completely through said first rollers into said parallel rows of aligned perforations, operable for thereafter feeding said wires through said needles, and for thereafter retracting said needles, means for operating said first rollers selectively in either direction, a second roller lockable for holding said needles and operable for thereafter retracting said needles into said first rollers, a brake for locking said second roller against said needles, means for holding said wires during said retracting operation and means for cutting said wires intermediate said support means and said rollers.

4. A device for threading coordinate filaments in an array of perforated elements comprising, in combination, means for supporting a plurality of said elements aligned in first parallel rows and in second parallel rows intersecting said first parallel rows, each said element being common to two said intersecting rows and said perforation of each said element being aligned with all perforations of both said common rows, a plurality of tubular elements, one for each said first parallel rows, alignable with said first parallel rows, means for rotating said support means for aligning said second parallel rows with said tubular elements, means to supply a continuous filament corresponding to each said tubular element, having one end inserted in said corresponding tubular element, a pair of first rollers initially engaging said tubular elements and operable for feeding said tubular elements completely through said first rollers into said parallel rows of aligned perforations, for thereafter feeding said filaments through said tubular elements and for thereafter retracting said tubular elements, a second roller lockable for holding said tubular elements after they are fed through said first rollers and operable thereafter for retracting said tubular elements into said first rollers, a brake for locking said second roller against said tubular elements, means for holding said filament during said retracting operation and means for cutting said filaments intermediate said support means and said rollers.

5. A device for threading coordinate filaments in an array of perforated elements comprising, in combination, means for supporting a plurality of said elements aligned in at least two intersecting rows, one said element being common to said two intersecting rows and said perforation of said one core being aligned with all perforations of both said common rows, at least one tubular element alignable successively with said intersecting rows, means for rotating said support means for successively aligning said intersecting rows with said tubular element, means to supply a continuous filament corresponding to each said tubular element, having one end inserted in said corresponding tubular element, means for feeding said tubular element into said aligned perforations, for thereafter feeding said filament through said tubular element, means for thereafter retracting said tubular element, means for retarding said filament during said tubular element feeding, means for holding said filament during said retracting, and means for cutting said filament.

6. A method of threading coordinate filaments in an array of perforated elements comprising the steps supporting a plurality of said elements aligned in at least two intersecting rows, one said element being common to said two intersecting rows and said perforation in said one element being aligned with all perforations of both said common rows, aligning a tubular element containing one end of a filament and a first one of said intersecting rows of elements, retaining the filament within said tubular element, feeding said tubular element into said aligned perforations, feeding said filament to project the end of said filament from said tubular element, holding said filament end, retracting said tubular element, severing said filament near the end of said retracted tubular element, aligning said tubular element and a second one of said intersecting rows, retaining the filament within said tubular element, feeding said tubular element into said aligned perforations of said second intersecting row again feeding said filament to project the end of said filament from said tubular element, holding said filament end, retracting said tubular element and severing said filament near the end of said tubular element.

7. A device for threading coordinate wires in an array of perforated elements comprising, in combination, means for supporting a plurality of said elements aligned in first parallel rows and in second parallel rows intersecting said first parallel rows, each said element being common to two said intersecting rows, said perforation of each said element being aligned with all perforations of both said common rows and said support means containing grooves in alignment with said openings of said second rows, a plurality of hollow needles, one for each said first parallel row, alignable with said perforations of said first parallel rows, means for rotating said support means for aligning said grooves and aligned perforations of said second

rows with said needles, means to supply a continuous wire corresponding to each said hollow needle, so that the wire ends are threaded into the respective hollow needles, a pair of first rollers initially engaging said needles and operable for feeding said needles completely through said first rollers into said parallel rows of aligned perforations, operable for thereafter feeding said wires through said needles, and thereafter for retracting said needles, means for operating said first rollers selectively in either direction, a second roller lockable for holding said needles after they are fed through said first rollers and operable thereafter for retracting said needles into said first rollers, a brake for locking said second roller against said needles, means for holding said wires during said retracting operations and means for cutting said wires intermediate said support means and said rollers.

8. A device for threading successive sets of perforated elements with wire from a continuous supply comprising, in combination, means for supporting a set of said elements in a row with said perforations in alignment, a tubular element having an outside diameter smaller than the perforations in said perforated elements threaded with said wire, first roller means initially engaging said tubular element and operable for feeding said tubular element completely through said first roller means and into

said perforations, said first roller means being then adapted to engage the wire behind said tubular element, whereby said wire can be fed through said tubular element by continued rotation of said first roller means, a second roller means engaging said tubular element and operable for retracting said tubular element into said first roller means, said first roller means being adapted to be reversely operated to thereafter retract said tubular element from said row of perforated elements, means for grasping the end of said wire during said retractions and means for cutting said wire between the end of the tubular element and the set of perforated elements after retracting said tubular element.

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CERTIFICATE OF CORRECTION

Patent No. 2,958,126 November 1, 1960

Walter P. Shaw et al.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 38, strike out "second" and insert the same after "said" in line 35, same column.

Signed and sealed this 25th day of April 1961.

(SEAL)
Attest:
ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents