# United States Patent

**Armstrong et al.**

[15] **3,703,950**

[45] **Nov. 28, 1972**


[54] **APPARATUS FOR MAKING EMBOSSING PLATES FOR THE BLIND**


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[22] Filed: **Dec. 14, 1970**

[21] Appl. No.: **97,671**

[52] **U.S. Cl.** .....**197/6.1,** 101/3 R

[51] **Int. Cl.** .....**B41j 3/32,** B44b 5/00

[58] **Field of Search** .....101/3 R, 3 SP; 197/6, 6.1, 197/6.2, 6.3



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[57] **ABSTRACT**

A press for forming braille-like line patterns of raised projections in embossing plates, for use in embossing sheets of paper in a printing press in making coloring books or the like for the blind. The press includes a rotary turn-table upon which the printing plates are supported while being embossed. A pair of forming dies engage the plates on the central axis of the table and form a raised dimple in the plates. The dies are mounted for movement in translation and are controlled in a cycle of operation to advance the plates through a small predetermined increment and then release and re-engage the plates at a new position for the purpose of forming a line of uniformly spaced dimples. The operator may rotate the plate on the platform to create curves and images, and to follow contours, to achieve a desired pattern of lines on the plate. The dies are supported on upper and lower control arms which are mounted for both horizontal and vertical movement, and are controlled by cams to effect the forming and advancing cycle. The cams are driven through a slip-belt type of clutch controlled to a foot pedal. The foot pedal also operates a stop which assures that the dies always come to rest in the open position.


**8 Claims, 9 Drawing Figures**

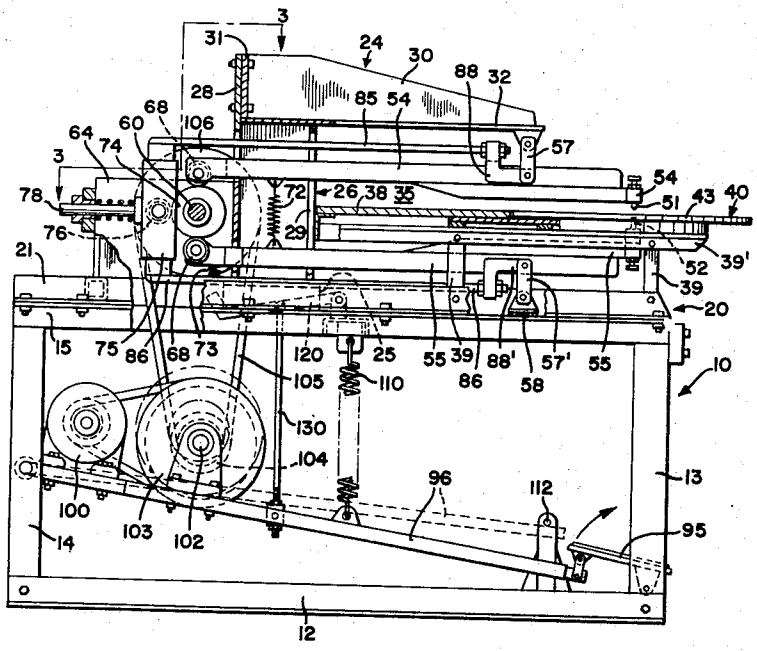


FIG-1

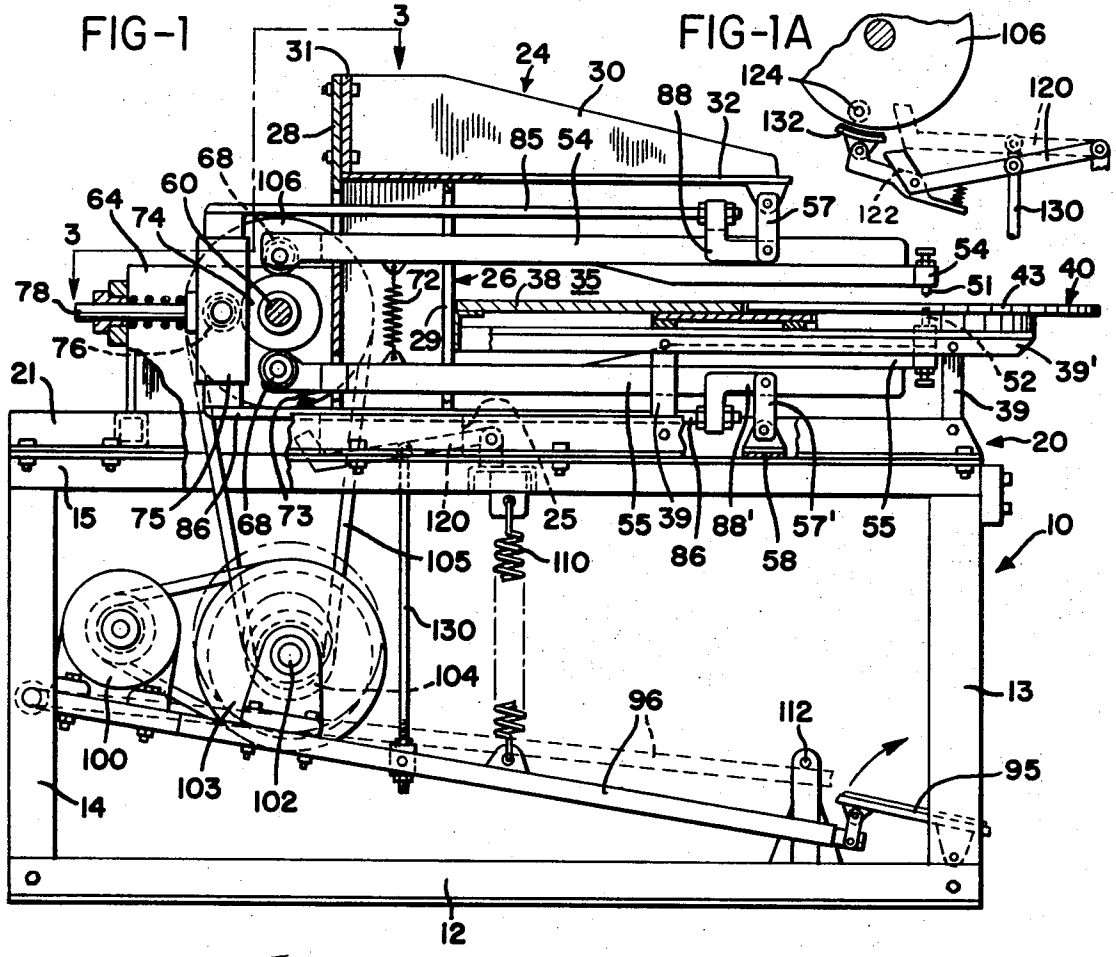



FIG-1A

FIG-2

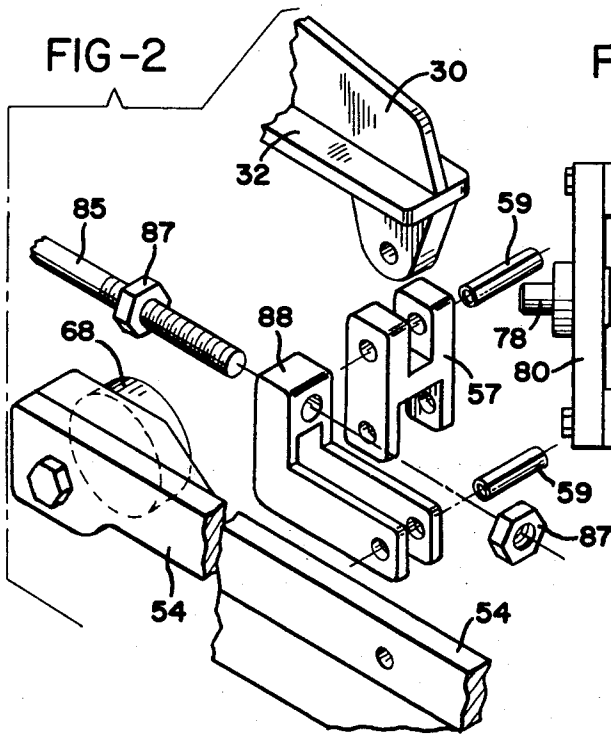
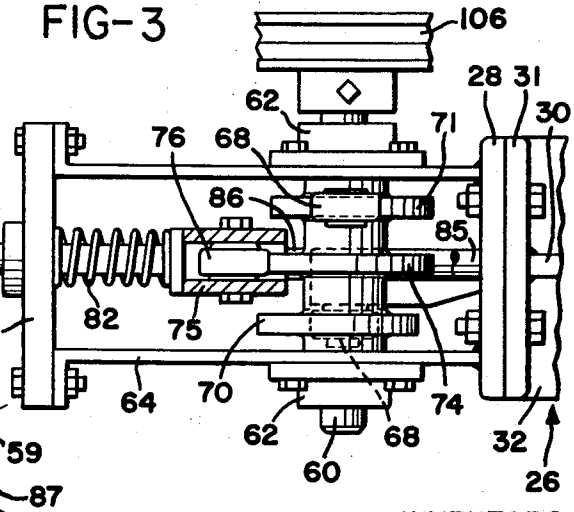



FIG-3




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FIG-4

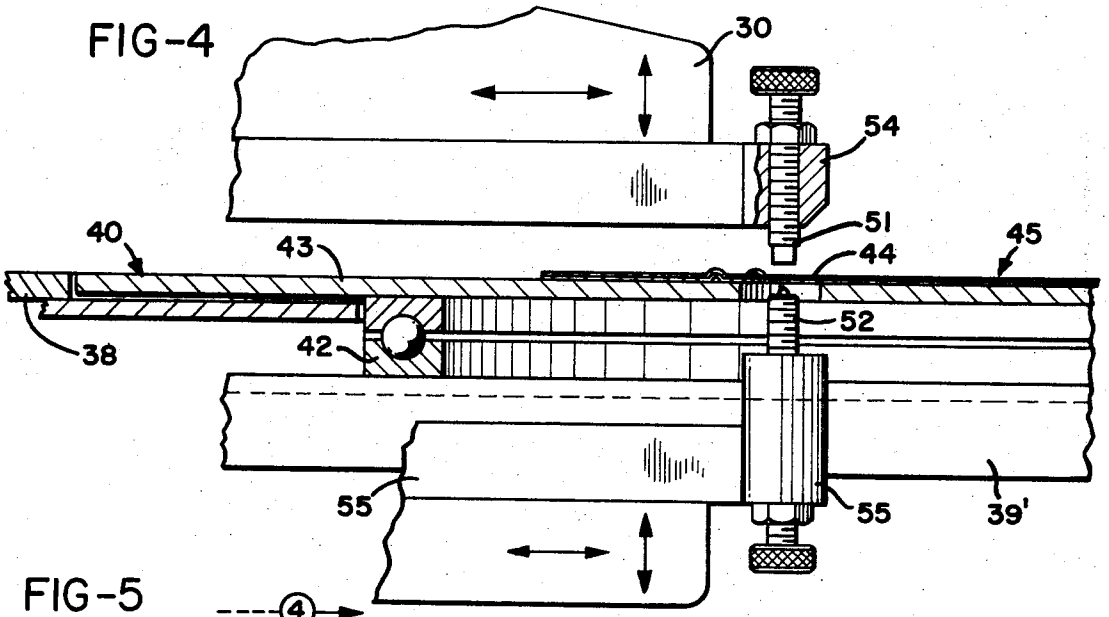



FIG-5

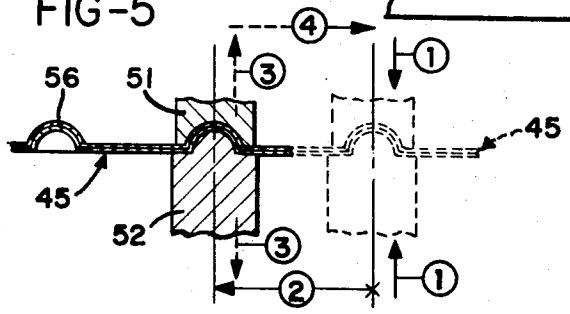



FIG-6

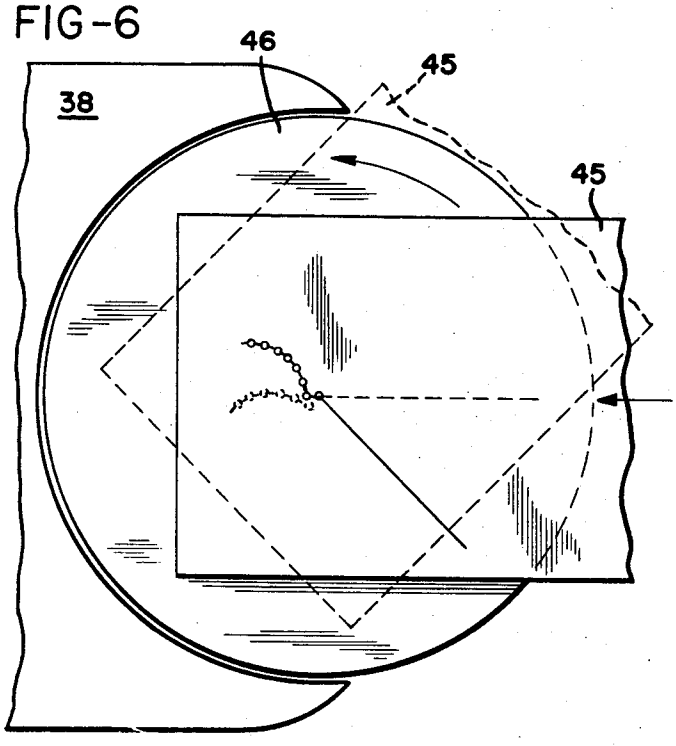



FIG-7

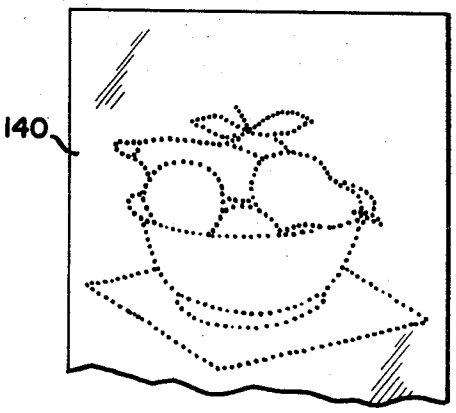
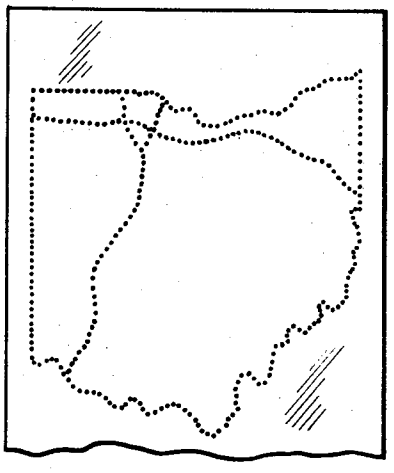



FIG-8



# APPARATUS FOR MAKING EMBOSSING PLATES FOR THE BLIND

## BACKGROUND OF THE INVENTION

It has been recognized that blind persons, particularly children, have the same desires and motivations as do children with normal eyesight. They want to learn like other children, they want to play like other children. They want to learn the shapes and outlines of objects such as normally presented on maps, the outlines of territories, the locations of rivers, roads and the like. Such children are eager to color in coloring books the same as children with normal vision, and by this means they can be taught the associations of colors with objects, such as green for grass, blue for sky, etc.

In the past, efforts have been made to make graphs, charts and coloring books by laboriously punching sheets of paper to form impressions which can be felt. Maps and the like have been produced on zinc plates which are used in embossing printing presses by laboriously hand punching individual dots on the plates to form a pattern of spaced dots defining the contour or location of objects on the graphs, maps or pictures for text and coloring books. As a result of the necessity for making embossing plates by such hand processes, these plates are quite expensive to make; and, accordingly, are not readily available to publishers of coloring books and the like.

## SUMMARY OF THE INVENTION

The present invention is directed particularly to a press for making printing plates having braille-like projections formed on the surface thereof. Particularly, the invention is adapted to make complex line-patterns of such projections or dots in zinc printing plates, with substantial savings in time over making the same plates by hand. With the apparatus of the present invention, an operator can quickly and readily follow lines in a manner somewhat like that of an operator using a jig-saw to cut out a pattern.

The press of the present invention is provided with a rotary turntable which is formed with, or which defines, an aperture or opening substantially at its center axis. The press further includes a pair of punching dies which cooperate to form a raised dimple on the printing plates. Usually, two plates are embossed simultaneously to form the male and female plate sections of the embossing press. The embossing dies operate at the region of the aperture with the lower die extending through the aperture into engagement with the sheets resting on the upper surface of the turntable. The dies are mounted, respectively, on upper and lower control arms which are, in turn, mounted on upper and lower support arms, and are provided with both linear and axial movement. A cam shaft is provided with two cam drives. A first cam set engages the free ends of the arms and causes them to move with an opening and closing movement while a second cam causes the arms to move with a back and forth movement to effect feeding of the plates. The cams are timed in such a manner that the dies close together on opposite sides of the plates to form a single projection, and while they are closed, the arms supporting the dies are moved in translation through a predetermined increment, such as 3/32 of an inch, to effect a feeding movement of the plates supported on the turntable. Continuing the cycle of operation, the dies are opened and returned to their original position, all in a single rotation of the drive shaft supporting the cams.



Means are provided for controlling the starting and the stopping of the embossing operation, as defined above, and preferably includes a clutch which may consist simply of a belt running between a pair of pulleys, and a lever adapted to tighten or slacken the belt. The same lever may conveniently operate a movable stop bar which engages a stop or pin on the cam shaft pulley to assure that the dies always come to rest in the open position.

It is accordingly an object of the invention to provide a press for forming a series of spaced projections on a sheet or sheets of deformable material, useful in forming embossing plates for embossing designs on paper as a teaching aid for the blind.

Another important object of the invention is the provision of a machine for making braille-like projections on embossing plates incorporating automatic punching and linear feeding apparatus and further providing means by which an operator can manipulate the plates to cause the machine to emboss patterns of such projections along predetermined contours and lines so as to form a desired design on the plates.

A further object of the invention is the provision of apparatus for forming embossing plates for making coloring book plates, textbook plates and the like for the blind.

These and other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevation, partially broken away of a press constructed according to this invention;

FIG. **1***a* is a fragmentary detail showing the stop and brake mechanism;

FIG. **2** is an exploded perspective view showing the toggle arrangement for attaching the upper control arm to the upper support arm;

FIG. **3** is a fragmentary plan view showing the cam drive arrangement for the upper and lower control arms;

FIG. **4** is an enlarged fragmentary plan view partially in section of the arms, the support table and the dies;

FIG. **5** is a diagram illustrating a cycle of operation of the dies;

FIG. **6** is a diagrammatic plan view of the turntable showing the manner in which a plate may be supported on the table to emboss a contour of individual projections thereon;

FIG. **7** illustrates a typical coloring book plate made in accordance with the invention; and

FIG. **8** illustrates a typical textbook plate also made in accordance with the invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. **1**, the press apparatus of this invention is shown as being formed with a lower box-like frame **10** which may be conveniently formed essentially of angle iron material including bottom floor engaging angle irons **12**, front vertical support angle irons **13**, and rear support irons **14**, and support irons **15** with

outwardly turned flanges. The press section of the invention is supported on an upper frame **20** which includes a rectangular arrangement of inverted angle irons **21** directly supported on the flanges of the lower angle irons **15**. The upper frame **20** is readily removable from the lower frame **10** for ease of transportation and setup of the press.

The upper frame **20** supports a C-frame or yoke illustrated generally at **24**. The yoke includes a lower supporting crossbeam **25** and a tower or standard **26**. Standard **26** may be formed as a vertical box-like structure including a slotted rear plate **28**, such as shown in FIGS. **1** and **3** and a shorter slotted front channel **29**. An upper support arm **30** has formed at its inner end a mating plate **31** bolted to the upright plates **28** and has a lower horizontal plate section **32** resting on the upper surface of the channel **29**. The arm **30** may, in transverse section, be in the form of an inverted "T" for rigidity, and defines with the lower frame **20** a clearance throat **35**.

The forward end of the upper frame **20** supports a platform or work table **38**, on upright members **39** and a cross member **39'**. The members **39** also support a turntable illustrated gernerally at **40**. The turntable **40**, as best shown in FIG. **4**, includes anti-friction bearing **42** supporting a table **43**. The turntable **43** is formed with a central opening or aperture **44** and has an upper surface on which a pair of zinc embossing plates **45** may be supported for forming by this invention. Preferably, two plates **45** are embossed simultaneously so that the same design is formed on each plate, and the plates are thereafter applied to conventional printing press for embossing sheets of paper therebetween with the design formed on the plates, essentially in the same manner as braille is now printed.

Means for embossing the plates includes a pair of embossing dies as best shown in FIG. **4**, including an upper die **51** and a lower die **52**. The dies are adjustably received, respectively, in the ends of an upper control arm **54** and a lower control **55**. The dies **50** are shown as being adapted to from a single raised projection or portion (FIG. **5**) on the sheets **45**, although it is within the scope of the invention to provide the working ends of the dies with any suitable embossing pattern.

The lower die **52** is mounted generally beneath the table **40** and extends generally axially through the bearing **42** and the opening **44**, and in the retracted position, as shown in FIG. **4**, clears the plates **45** supported on the turntable.

The upper control arm **54** is supported on the upper support arm **30** by a generally "H" shaped toggle **57** (FIG. **2**). The toggle **57** is pivoted at its lower end by a pivot pin **59** to the arm **54** and at its upper end by a pivot pin **59** to the arm **30**, and thus provides for pivotal and translational movement of the arm **54**. The lower control arm **55** (FIG. **1**) is similarly mounted on another toggle **57'** to the cross support member **58** on the upper frame **20**, for pivotal and translational movement.

Means for causing the control arms and the associated dies to move in a cycle of operation for embossing and feeding the plates **45** includes a cross shaft **60** (FIG, **3**) supported on bearings **62** between a pair of side plates **64**. The plates **64** are mounted as a rearward extension from the vertical plate **28** of the support **26**.

Cam means are supported on the shaft **60** for the purpose of controlling the movement of the control arms **54** and **55**. For this purpose, the inner free ends of the arms **54** and **55** are laterally offset and are provided with rollers **68**. The lateral offset is such that the roller of the lower arm **55** rides on the cam **70** and the roller **68** of the upper arm **54** rides on the cam **71**, as shown in FIG. **3**. A spring **72** (FIG. **1**) extends between the arms **54** and **55** and urges the rollers into engagement with the respective cams, and a lower support spring **73** maintains the roller of the arm **55** into engagement with the cam **70**. The cams **70** and **71** (FIG. **3**) are similarly formed but are oppositely timed so that the control arms are caused simultaneously to close and then to open with each rotation of the shaft **60**.

Means for causing the dies **51** and **52** to move or advance the sheet **45** by a given or predetermined increment in each cycle of operation includes a third cam **74** mounted axially between the cams **70** and **71**. Follower means includes a vertical yoke **75** supporting a follower roller **76** which bears against the cam **74**. The yoke **75** is guided for horizontal movement by a guide pin **78** extending through a rear wall **80** mounted on the plates **64**. A compression spring **82** assures engagement with the cam **74**.

Means for coupling the movement of the yoke **75** (FIG. **1**) to the control arms **54** and **55** includes an upper control rod **85** and a lower control rod **86**. The upper rod **85** has its inner end fixed to the top of the yoke and has its forward end adjustably connected by threads and nuts **87** into an L-shaped bracket **88** mounted on the arm **54** at the pivotal connection of the toggle **57**. The lower control rod **86** is similarly connected to a link **88'**. In a single rotation of the cam **74**, the arms are caused to move in translation by pivotal movement on the toggle links **57** and **57'**. The cam **74** (FIG. **3**) is related to the cam **70** and **71** so that the dies first close on the plates **45** to emboss a projection **56** on the plates, as shown by the step No. **1** of FIG. **5**. The projection may be in the order of 1/32 of an inch in diameter. Thereafter, the dies are moved to a position as shown in full line along the direction of the arrow No. **2**. this movement may be in the order of 3/32 inch. The dies then open along the direction of the arrow No. **3** and return, while open, to the starting position as shown by arrow No. **4**. This movement, of course, occurs rapidly and the speed of the machine can be set to suit the operator, such as by an adjustable pulley on the drive motor.

In order to provide freedom for the operator so that he may use both hands in guiding the plates **45**, control means on the frame **10** (FIG. **1**) for driving the forming mechanism includes a foot pedal **95** pivotally mounted on the upright members **13**. The pedal **95** is connected to raise and lower a bar **96** on which is mounted an electric drive motor **100** and a cross shaft **102**. For speed reduction, the motor **100** drives a large pulley **103** mounted on the shaft **102**, and an adjacent small pulley **104** is connected by a belt **105** to a large pulley **106** mounted on the extended end of shaft **60**. A tension spring **110** urges the bar **96** to a raised position as defined by a stop **112**, in which position the belt **105** is slack. When the pedal **95** is depressed, the slack is taken up, and thus this arrangement defines clutch means connecting the motor **100** to drive the shaft **60**.

Apparatus is further provided for assuring that the shaft **60** always stops in a position with the dies **51** and **52** in the open position. For this purpose, a stop bar **120** (FIG. 1*a*) is pivotally mounted on the frame **10** and includes an end **122** adapted to engage a stop pin **124** carried on the pulley **106**. When the pedal is depressed, a connecting rod **130** retracts the stop bar **120** to the full line position shown in FIG. 1*a* and simultaneously tightens the drive belt **105**. However, when the pedal **95** is released, the bar **120** is raised into interferring relation with the pin **124** and will permit rotation only to the point that the pin contacts the stop **122** defining the open position of the dies. If desired, the stop bar **120** may be provided with a friction brake **132** to absorb some of the energy of the rotating mechanism prior to the impact of the pin **124** with the stop **122**.

The operation of the invention is largely self-evident from the foregoing description. A pair of plates **45** having a desired pattern of lines traced on the upper surface may be placed on the turntable **43** between the open dies. When properly positioned at a starting point, the operator will depress the pedal and the dies will begin embossing and moving the plates **45** in translation through predetermined small increments. The operator simply guides the plates by rotating the same with the turntable **43**. Preferably, the turntable is on the axis defined by the open position of the dies, but since the movement of the dies is through a relatively short distance, this is not critical and the axis of rotation could just as well be at the moved position of the dies.

By observing the operation, the operator simply rotates the plates to cause the press to emboss along a predetermined curve or contour, as illustrated in FIG. **6**. It is not necessary to stop the pressing operation to make gentle curves. It is only necessary to stop the operation when it is desired to form a sharp turn or to start a new line. A coloring book plate made according to this invention is illustrated at **140** of FIG. **7**. It shows the manner in which the outline of recognizable articles can be embossed into a sheet of paper to provide a coloring book and a teaching aid. In FIG. **8**, there is illustrated a textbook plate illustrating the outline of the State of Ohio and some of the topographic features, such as principal roads, rivers and the like.

Whenever the pedal **95** is released, the belt **105** is slackened and the stop bar **130** is moved into its transferring position and causes the dies to stop in the open position as shown in FIG. **4**.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention.

What is claimed is:

**1**. A press for making plates having braille-like projections formed on the surface thereof useful in making braille picture and text books, coloring books, line drawings, maps and the like, comprising a pair of opposed dies each having cooperating working portions which when moved together form discrete braille-like raised portions on a printing plate, die operating means for opening and closing said dies and for effecting translational movement of said dies while said dies are closed and for opening said dies and returning the same to their original position in a cycle of operation so that the degree of translational movement defines the space between adjacent raised portions on such plate, and a turntable for supporting such plate on a plane which passes between said dies in the open position thereof and having an axis of rotation which is generally coincident with the centerline of said dies to permit an operator to turn such plate at will to form desired patterns or images thereon.

**2**. The press of claim **1** in which said operating means for said dies include an upper control arm supporting one of said dies, a lower control arm supporting the other of said dies, means mounting said arms for vertical and horizontal movement with respect to said plane, and cam means connected to operate said arms to effect said closing, translational, opening and return movement of said dies.

**3**. The press of claim **1** further comprising drive control means for selectively causing said dies operating means either to cycle continuously or to stop said dies in the open position.

**4**. A press for forming plates for making braille-like pictures, coloring books, maps, textbook drawings and the like comprising a stand, a work-supporting platform rotatably mounted on said stand, a pair of braille-projection forming dies including an upper die and a cooperating lower die positioned at opposite sides of said platform and generally on the rotational axis of said platform, means in said platform defining an aperture through which said lower die can move into engagement with printing plate supported on said platform, upper and lower support arms operatively associated respectively with said upper and lower dies, support means mounting said arms respectively for vertical opening and closing movement and for horizontal translational movement, a cross shaft, first cam means on said shaft engageable with said arms for moving said arms for effecting said opening and closing movement thereof, second cam means engageable with said arms for effecting said horizontal movement thereof, said cams being arranged in timed relation to effect closing movement of said dies followed by horizontal movement thereof to cause feeding of a printing plate followed by opening movement and by horizontal return movement of said dies to an original position in a cycle of operation, a drive motor, controllable clutch means connecting said drive motor to said cross shaft, and controllable stop means for stopping said cross shaft when said dies are in said open position.

**5**. The press of claim **4** further comprising a common manual operator which is movable in one direction to engage said clutch means and which is movable in another direction to engage said stop means.

**6**. The press of claim **5** in which said common operator includes a foot pedal which is depressed to engage said clutch means and is released to engage said stop means.

**7**. In a press for making printing plates with line-patterns of braille-like raised portions, the improvement comprising a turntable for supporting printing plates for manual rotation about an axis, means in said turntable defining a central opening, upper and lower dies at said opening for engaging and embossing a said raised portion on printing plates received on said turntable,

and means supporting said dies for axial closing and forming movement and a transverse feeding movement within said opening and with respect to said turntable for serially advancing said plate through small increments to form such line-pattern of raised portions.

8. Apparatus for forming a series of spaced projections within a sheet of deformable material to produce a predetermined pattern which may be sensed by the fingers, said apparatus comprising spaced punch and die means, means supporting said punch and die means for relative movement between an open position for receiving the sheet and a closed position for deforming the sheet and forming an integral projection in the sheet, said supporting means further supporting said punch and die means for lateral movement as a unit between first and second positions with said punch and die means substantially in said closed position to cause shifting of the sheet laterally by a predetermined distance, and drive means for moving said supporting means to effect coordinated movement of said punch and die means between said open and closed positions and between said first and second positions according to a predetermined cycle for causing step-by-step advancement of a sheet and for successively forming a series of the projections within the sheet.

* * * * *