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(54) **Graphic arts die and support plate assembly**

Graphische Druckplatten und Halteplatten

Ensemble plaque-support et matrice d'arts graphiques

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(73) Proprietor: **UNIVERSAL ENGRAVING, INC.**
**Overland Park, KS 66214 (US)**

(72) Inventors:
- **Hutchison, Larry**
  **Overland Park**
  **Kansas 66221 (US)**
- **Smith, Derek**
  **West Sussex BN43 5AE (GB)**

(74) Representative: **UEXKÜLL & STOLBERG**
**Patentanwälte**
**Beselerstrasse 4**
**22607 Hamburg (DE)**

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## Description

### Field of the Invention

**[0001]** This invention relates to a graphic arts die and support assembly adapted to be mounted as a unit on the platen chase of a flat bed graphic arts press or the chase for the cylinder of a rotary graphic arts press. Each of the dies is fixedly mounted in predetermined relative relationship on a die carrier or mounting plate serving as a support member for the dies. A number of arcuate die carrier plates are provided in instances where the curved die carrier plates and associated curved dies are to be mounted on the cylinder of a rotary graphic arts press in disposition such that the assembly of die plates and dies may extend more than 180° around the circumference of the cylinder. Furthermore, each die may be moved slightly relative to the remaining dies during set up of the press to bring the design defining surface of each die into exact register with artwork for the substrate being processed in the press.

**[0002]** In the case of an assembly of curved die carrier plates and associated curved die units for rotary graphic arts presses, at least one of the die carrier plates is preferably provided with a scribed centering line or other marker indicia. The curved plate having a centering indicia is adapted to be attached to the cylinder of the rotary press in register with a conventional center line on the press cylinder that is equally spaced from the ends of the cylinder. The remaining curved die supporting plates may then be attached to the cylinder based on the position of the registered first attached plate, so that all of the die supporting plates are in proper registration with the center line of the cylinder.

### Background of the Prior Art

**[0003]** In conventional stamping, embossing, or die cutting presses, it has long been the practice to provide an apertured chase for mounting the stamping, embossing or die cutting dies on a flat bed press or the apertured chase of a rotary press. Fasteners received in the apertures of the flat bed chase or cylinder chase of a rotary press engage the edge of the die to hold the dies in selected positions on the flat bed or rotary press.

**[0004]** Typical flat bed chases are 56 cm (22 in.) by 71 cm (28 in.), 71 cm (28 in.) by 102 cm (40 in.) or 99 cm (39 in.) by 127 cm (50 in.) in size. These chases are usually from about 15,9 mm (0.625 in.) to about 51 mm (2 in.) thick steel with closely spaced apertures formed in the chase for receiving fasteners such as toggle devices. Similarly, rotary cylinders for mounting of curved dies generally are in the 20 cm (8 in.) to 30 cm (12 in.) diameter range and have an apertured sleeve chase for the rotary press cylinder, in which the sleeve chase has closely spaced fastener receiving holes. Fasteners are employed to secure a multiplicity of stamping, embossing, or die cutting dies to the die mounting surface of the apertured chases. Each fastener, which is preferably a toggle device, is introduced into an aperture in the flat bed chase or the apertured sleeve chase for the cylinder of a rotary press adjacent to an edge of a respective die and the toggle device expanded with a tool to bring a beveled edge of the hold down device into engagement with a complementally beveled edge of a respective die. Typically as many as six fasteners may be required to secure a rectangular stamping, embossing, or die cutting die to a flat bed press chase or rotary press chase. Chases of the type described typically cost many thousands of dollars. The toggle hold down devices are also relatively expensive and in a typical die set up, there may be a need for as many as 100 fasteners, depending upon the size of the flat bed chase or the diameter of the rotary cylinder chase and the number of dies attached to the flat bed or rotary press.

**[0005]** Set up, also known as lock-up, of foil stamping, embossing, or die cutting dies on an apertured chase, whether flat or cylindrical, is very time consuming. Each of the dies must be oriented on a respective apertured chase in disposition such that the design image of each die correctly and precisely aligns with image design artwork.

**[0006]** Lock-up is accomplished by placing the first of a series of foil stamping, embossing, or die cutting dies on the die support surface of the apertured chase of a flat bed press, or the apertured sleeve for the cylinder of a rotary press in approximately the position where the die image will align with design image artwork. Fasteners in the nature of conventional toggle devices are inserted in the nearest aperture of the flat bed chase or rotary press chase in a position such that an inclined surface of each toggle device is against the inclined edge of the die plate. A certain degree of movement of the die with respect to the chase or cylinder may be accomplished by adjusting the toggle device contained within a particular aperture in the multi-apertured chase.

**[0007]** After the first die plate has been secured to the chase in proper disposition, the entire securement process must be repeated with the next die plate and continued until all of the die plates have been attached to the chase. Manifestly, this is a very expensive procedure from the standpoint of personnel costs, and in certain instances excessive downtime of the press. The lock-up must be carried out in accordance with a successive time consuming step-by-step process of attaching a multiplicity of flat or curved die plates to an apertured chase. In addition, once all of the dies are mounted on its chase, whether it be flat or cylindrical, adjustment of individual stamping, embossing or die cutting may be required to bring respective die images into exact alignment with design image artwork.

**[0008]** Because of the high labor costs involved in lock-up of multiple die stamping, embossing or die cutting dies on flat bed or rotary presses, some press operators elect to dedicate a specific flat or cylindrical chase with dies mounted thereon to a high volume processing operation.

The result is that the operator must acquire and keep on hand a number of individual chases with dies in place thereon for a particular job. In view of the high cost of chases and the costs involved in providing a large number of toggle hold down devices for the dies, locked up dedicated flat or cylindrical chases is an expensive but often necessary undertaking.

**[0009]** Cylindrical die supporting plates have been provided for rotary press cylinders, with a plurality of curved dies being attached to the surface of the cylindrical support plate. In order to mount the cylindrical die support plate on the press cylinder, it has been necessary to remove a side plate from the press, which can take as long as four hours and is an expensive, cumbersome, and time-consuming operation. In addition, because of the time involved in makeready of a cylindrical die supporting plate assembly, many press operators have elected to provide a separate cylinder and associated dies for each job, with the pre-madeup cylinders being interchanged as necessary. The costs incurred limited this practice to very large runs in order to fully amortize the labor and equipment expenses.

**[0010]** Alternatively, curved dies have been fabricated and used in the past on rotary press cylinders, but the curved dies were limited to a circumferential arc no greater than 180°, so that the dies could be attached to the surface of the cylinder. This requirement limited the applicability of such arrangement for rotary presses. Given the limitation of a die no greater than 180° in circumference, press operators have mounted a series of individual curved die plates on the press cylinder, which did extend more than 180° around the circumference of the cylinder. The dies had to be individually mounted on the cylinder of the press oriented such that each was in register with respective images on the substrate brought into contact with the dies. This was recognized to be so labor intensive and time-consuming that low volume runs were of limited practicality.

**[0011]** US 6,658,978 describes a steel rule die for cutting clothes and synthetic materials. The steel rule die comprises a first substrate and a plurality of cutting units attached thereto via holding devices, such as screws or bolts, connected to an internally threaded insert extending through the primary substrate.

**[0012]** EP 1 457 297 discloses a device for embossing and/or die cutting comprising an embossing and/or die cutting tool, a carrier having one or more recesses, and one or more positioning devices which are reversibly inserted or insertable in the recesses. The tool and positioning device are both removable.

## Summary of the Invention

**[0013]** The present invention is directed to a graphic arts die assembly according to claim 1 and to a method of preparing a graphic arts die assembly according to claim 36. In accordance with the present invention, a press operator, whether using a flat bed or rotary press, need only provide the engraver with a conventional positive/negative film, or a digital file of the design art work. The film preferably has a line or other indicia mark that is used for registration of the die plate of a flat bed press with the press platen, or the plurality of die plates mounted on the cylindrical chase of a rotary press. The engraver preferably uses the artwork or a digital file thereof to program a CNC machine, which then forms a design image in a metal die plate blank, wherein the design image in the plate conforms to the artwork image. In lieu of CNC milling of the design image in the die blank, an engraver may hand engrave the design image using an outline on the blank that was derived from a digitized file of the design image. The engraver in that instance may use conventional techniques including a hand tool, a grinder, and the like. Other image forming techniques may be used including a conventional pantograph, computer actuated laser engraving, or chemical etching of the design on a die blank that has a resist coating leaving only the area to be etched open for contact by the etchant solution.

**[0014]** The CNC machine, containing a file of the design image art work preferably has a program for preparing a flat or a curved support plate for a multiplicity of the pre-engraved dies, or multiple arcuate support plates that carry one or more curved dies, and for providing aligned openings in the die blank and support plate receiving fasteners which fixedly although adjustably secure the die plates on a respective support member in disposition, wherein all of the dies on a flat support plate are accurately aligned with the original artwork design, or allow curved support plates and dies to be positioned so that the dies are registered with the artwork.

**[0015]** Thus, the engraver may furnish to its customer a completed flat graphic arts die assembly ready to be mounted on the apertured chase of a flat bed press or a multiplicity of curved die carrier plates and arcuate dies that may be mounted on the apertured cylindrical chase of a rotary press. The press operator is therefore not required as in the past to meticulously and successively mount a series of foil stamping, embossing, or die cutting dies on a flat bed chase or rotary press chase. Likewise, dedication of a flat or cylindrical chase with mounted dies thereon for high volume jobs is no longer necessary, thus freeing up chases and thereby decreasing the need for additional chases, and toggles, and significantly reducing makeready of the press for foil stamping, embossing, or die cutting jobs on flat bed as well as rotary presses.

**[0016]** In most foil stamping, embossing, and die cutting j obs, a plurality of dies are provided to stamp, emboss or die cut a multiplicity of design images. Thus, in one embodiment of the invention, the graphic arts die assembly has a number of individual dies mounted in spaced relationship one from another on a support member. The support with the dies thereon is adapted to be mounted as a unit on the chase of a flat bed or the cylindrical chase of a rotary graphic arts press. The individual dies each have a design defining surface conforming to design artwork furnished to the engraver as a positive or

negative film or digital file representation of the desired design. The support member for the dies preferably comprises a relatively thin flat metal plate, or a semi-cylindrical plate member, each being sized for mounting on a flat bed chase or a rotary press chase.

**[0017]** In another embodiment of the invention, a plurality of separate curved die carrier plates are provided, each of which has an inner face adapted to complementally engage the cylindrical surface of a rotary press chase. Each of the curved carrier plates is designed to receive one or more complementally configured curved dies. The separate die carriers are each of a curvature less than 180° so that the carriers may be mounted on the rotary press chase without removal of an end plate of the press. Structure is provided for facilitating registration of all of the curved die carriers with respect to one another and with a circumferentially oriented center line of the cylindrical press platen.

**[0018]** The pre-engraved graphic arts dies are mounted on the die receiving surface of the die support carrier member in pre-determined relative positions. Each die has at least two through holes oriented outboard of and in pre-determined relationship with respect to the design defining surface of a respective die. An upstanding die fastener is provided on the die receiving surface of the die support member for each of the through holes with respective fasteners being received in a corresponding through hole. A releasable connector on each fastener engages a respective die for maintaining each die in a fixed position on the die support member.

**[0019]** In a preferred embodiment of the invention, each of the fasteners is a threaded stud welded to the die receiving surface of the support member. The releasable connectors are preferably nuts threaded onto a corresponding fastener. The design defining surface of each die has a cavity therein lined with a respective through hole and configured to receive a corresponding nut threaded onto each fastener.

**[0020]** The support plate also may be provided with one or more hold down slots located adjacent a die. Fastening devices are utilized in association with each hold down slot in disposition engaging the support member at a location surrounding the slot. The fastening devices are adapted to be received in aligned apertures in the flat bed press chase or rotary press cylindrical chase and serve to maintain a central portion of the support member during use of the graphic arts die assembly in close conformity to the surface of the supporting chase during the various operating conditions of a flat bed or rotary press.

**[0021]** Each die is also preferably provided with at least two alignment apertures therein outboard of the design defining surface of the die and that align with the respective orifices in the support member. Thus, by inserting temporary pins or the like in the apertures of each die and introducing the pins into respective orifices in the support member, each die may be maintained in its precise predetermined position on the support plate until the connector nuts are snugged down against the surface of the die plate. Additionally, the provision of the alignment apertures and orifices permit a die to be returned to its original position using the alignment pins if the die has been shifted on or removed from the die support member.

**[0022]** In a preferred procedure for fabrication of the graphic arts die assembly, the design to be engraved in the surface of a respective die is digitized and the digital data used to program a CNC machine. That machine then engraves the design in one surface of a respective die blank. Alternatively, the design may be hand engraved, engraved with a pantograph, laser engraved or chemically etched in accordance with conventional engraving procedures. The program of the CNC machine causes at least two through holes to be drilled in the die outboard of the engraved design, with the holes being precisely located with respect to the engraved design image. The locations of the through holes relative to the design image is digitally stored in the program associated with the CNC machine. The program for the CNC machine also remembers the digital data relating to the same or different engraved images on the series of dies to be mounted on a particular support plate therefor, as well as the relative positions of the through holes in each die.

**[0023]** The CNC machine is programed to shave the outer die receiving surface of a respective support member in order to assure that the surface is precisely parallel with the opposite surface of the support member which engages the flat bed chase. In the case of a rotary cylinder chase, rather than using a CNC machine for surfacing of the die support member, a grinding machine is preferably used to grind the die receiving surface of the support member and thereby provide a die carrier plate of predetermined, specific thickness. Alternatively, the die receiving surface of the support member may be shaved with a CNC machine while the support member is in a flat condition, with the shaved support member then being bent into circular configuration with a conventional roll former. The perimeter edge of the support member is laser cut or machined by the CNC unit in order that the exact location of the edge is maintained in the program memory for the CNC machine. The CNC unit is further programmed to position and weld threaded studs on the die receiving surface of the support member in locations to be received in respective through holes through the dies and to thereby position the dies in precise relationship one with respect to another and relative to the accurately formed edge of the support member. After placement of the dies over corresponding studs, nuts are threaded onto the upper ends of the studs in association with a respective washer, if needed. Each die is provided with cavities in the design defining surface thereof for receiving the nuts threaded onto corresponding studs. Temporary pins are preferably placed through the aligned apertures of the die and respective orifices in the support member to maintain each die in a precise location until the nuts can be applied to corresponding studs and turned down into firm locking engagement with the design defining surface of each die.

**[0024]** Because the perimeter edge of the support member has been accurately machined and the dies positioned on the plate in pre-determined relationship to the edge, the completed die assembly may be mounted on a flat bed press chase using an edge of the support unit as an alignment guide for the graphic arts die assembly with respect to portions of substrate or other material to be foil stamped, embossed, or die cut. When being mounted on a rotary press cylindrical chase, the completed multi-section die assembly may be mounted on the chase using an edge of each support unit as a guide for alignment of adjacent die carrier supports. Notches at the same position in the edges of each of the support units serve as keys for registration of adjacent support carriers, preferably in conjunction with a spacer tool adapted to be received with opposed aligned key notches of adjacent support members.

**[0025]** After use of the graphic arts die assemblies, a single carrier plate supporting a plurality of dies, or multiple die carrier plates with one or more dies can be quickly removed from the flat bed press chase or rotary press chase and other pre-prepared graphic arts die assemblies mounted in place, with minimal makeready being necessary before full press operation. In those instances where slight adjustment of one or more of the dies is found necessary, such adjustment may be quickly and easily accomplished by virtue of the fact that the through holes are slightly larger than the studs therein. Upon loosening of the nuts on the studs for the particular die, the die may be shifted as necessary to bring the design image of the die into precise alignment with the area of the substrate to be foil stamped, embossed, or die cut. Then the nuts can be re-tightened to maintain the die in its newly established position. On the other hand, if it is desired to return a shifted die to its original location, that may be accomplished by loosening the nuts associated with that die, and shifting the die until pins placed in the alignment apertures align with respective orifices in the support member thus assuring that the die has been returned to its original location on the support member.

Description of the Drawings

**[0026]**

Fig. 1 is a fragmentary perspective view of a graphic arts die assembly in accordance with a preferred embodiment of this invention;

Fig. 2 is a fragmentary, exploded perspective view of components of the graphic arts die assembly as shown in Fig. 1;

Fig. 3 is a fragmentary, enlarged plan view of the graphic arts die assembly;

Fig. 4 is a horizontal cross-sectional view taken on an irregular line 4-4 through Fig. 3;

Fig. 5 is an enlarged perspective view of one of the externally threaded studs welded to the support member of the assembly as shown in Fig. 1 and Fig. 2;

Fig. 6 is a fragmentary plan view of one corner of the graphic arts die assembly shown mounted in place on the chase of a flat bed press;

Fig. 7 is a schematic representation of a typical flat bed press and showing one position of the graphic arts die assembly mounted on the chase of the press;

Fig. 8 is an enlarged vertical cross-sectional view through the platen and die assembly of Fig. 7;

Fig. 9 is a perspective view of rotary foil stamping, embossing, or die cutting mechanism, which includes an apertured cylindrical chase on a rotary cylinder and an opposed anvil roller;

Fig. 10 is a fragmentary, enlarged cross-sectional view of one of the studs mounted on the apertured cylinder for securing the semi-circular support member and associated curved die plates to the cylinder;

Fig. 11 is a perspective view of rotary press structure as shown in Fig. 9, but in this instance mounting a plurality of separate die carriers, which collectively wrap around the chase of the rotary platen more than 180°;

Fig. 12 is a perspective view of one of the curved dies adapted to be mounted on a respective die support member as illustrated in Fig. 11;

Fig. 13 is an enlarged, schematic cross-sectional representation of one form of tool receivable in opposed alignment notches in the edges of respective die support members that is useful to equally space adjacent die support members mounted on the cylindrical chase of a rotary press;

Fig. 14 is an enlarged fragmentary plan view of two adjacent curved die support members having registration notches in opposed edges thereof that are used in association with the tool of Fig. 13 to register and space adjacent support plates;

Fig. 15 is a schematic vertical cross-sectional view taken substantially on the line 15-15 of Fig. 14 and looking in the direction of the arrows;

Fig. 16 is an enlarged fragmentary vertical cross-sectional view through a rotary cylindrical platen with curved die support plates and associated dies thereon, with the support plates being attached to the outer cylindrical surface of the rotary chase;

Fig. 17 is an alternate embodiment of the multiple die support members in which edges of proximal plates have interlocking tongue and notch structure for aligning adjacent support plates one with respect to the other;

Fig. 18 is a fragmentary enlarged plan view of one of the support members illustrating the provision of slots in the support members designed to receive a suitable instrument for minutely adjusting the position of a die on the support member;

Fig. 19 is a fragmentary vertical cross-sectional view taken substantially along the line 19-19 of Fig. 18;

Fig. 20 is a fragmentary enlarged plan view of one of the support members similar to Fig. 18 but illus-

trating an alternate embodiment of structure for shifting a die to a minute degree using another form of tool than the tool shown in Fig. 19;

Fig. 21 is a fragmentary vertical cross-sectional view taken substantially along the line 21-21 of Fig. 20;

Fig. 22 is a perspective view of a tool useful for minutely adjusting the position of a die on a corresponding support member;

Fig. 23 is an enlarged fragmentary plan view of a graphic arts die assembly provided with a die carrier plate having a number of dies attached to the surface thereof, and specifically adapted to be mounted on a rotary press cylindrical chase provided with alternate rows of threaded openings and smooth bored alignment openings;

Figs. 24 and 25 are enlarged vertical cross-sectional views taken substantially on the lines 24-24 and 25-25 respectively of Fig. 23; and

Figs. 26, 27, and 28 are schematic plan views of a die carrier support member illustrating the position of registration lines or indicia on the surface thereof that are useful in facilitating alignment of respective die support plates with a circumferentially disposed center line mark of a rotary press platen.

Description of a Preferred Embodiments of the Invention

**[0027]** a. Preferred Embodiment of a Die Carrier Plate for a Plurality of Dies and Adapted to Be Mounted on a Flat Bed Press Chase or Rotary Press Cylindrical Chase.

**[0028]** The graphic arts die assembly broadly designated 10 includes, in a preferred embodiment, a relatively thin flat metal die support member or plate 12. The member 12 has a normally uppermost die receiving flat surface 16 and an opposed flat, chase engaging surface 30. A number of foil stamping, embossing or die cutting dies 14 are selectively mounted on the die receiving surface 16 in predetermined relative relationship, one with respect to the other, and also relative to the perimeter edge 18 of the member 12.

**[0029]** Each of the dies 14 preferably comprises a flat or curved plate having a design defining image 20 engraved in the normally uppermost surface 22 of each die 14. The design image 20 may be formed by hand using suitable hand and/or power operated tools, employing a conventional pantograph machine, laser engraved, or chemically etched. However, in a preferred embodiment of this invention, the design image 20 is formed in the normally uppermost surface 22 of the die 14 utilizing a CNC machine programed to execute engraving of the die plate 14, thus assuring that the engraved image conforms exactly to a design image of a positive or negative film representation, or a digital file of the artwork used for foil stamping, embossing, or die cutting of a substrate sheet or web, or other material.

**[0030]** The CNC machine also mills the outer edge 26 of the die 14 to provide either a vertical or a beveled surface. In addition, the machine edge 26 is in precise disposition with respect to the design defining engraved image 20, or vice versa.

**[0031]** The CNC machine also drills at least two, and preferably three through holes 28 through the thickness of die plate 14, again in precise disposition relative to the engraved image 20 in the upper surface of the die. Through holes 28 are desirably located in relative relationship such that when mounted on the support member 12, the plate can be positioned in only one orientation with reference to the support member 12.

**[0032]** The CNC machine also is controlled by a program that is functional to prepare the support member 12. One function of the CNC machine after the support member 12 has been positioned on the bed of the CNC machine in predetermined disposition, is to shave the entire upper die receiving surface 16 of member 12 so that surface 16, throughout its entire area, is in precise parallelism with the opposed chase engaging surface 30 of member 12. The outer surface of a curved die carrier support is preferably ground to provide a die support plate of predetermined thickness having equally spaced outer surfaces using a conventional grinding machine. This grinding operation assures that the plate is of uniform and prescribed thickness throughout the extent thereof. When the curved die carrier support is fabricated from an initially flat plate, a CNC machine is used to shave the die receiving surface of the die carrier support, and the shaved plate is then bent into circular configuration by a conventional roll former. The program for the CNC machine also is operable to mill the perimeter edge of the member 12 and to store in the program memory the location of the edge with respect to the exact center point of member 12. In lieu of using the CNC machine to mill a perimeter age of the member 12, the CNC machine may be programmed to control a laser cutter that precisely cuts the edge of member 12.

**[0033]** A third function of the program for the CNC machine is to accurately position and weld a series of externally welded studs 32 to the die receiving surface 16 of member 12. An example of a suitable capacity discharge stud positioner and welder is available from Cutlass Fasteners Inc. as its "Cutlass Classic". The stud positioner and fastener mounted on the spindle of the CNC machine is used to hold each stud, position one end of a respective threaded stud against the die receiving surface 16 of die support member 12 in a predetermined position established by the program of the CNC machine, and to effect welding of the stud to the support member. Welding time for each stud is normally no more than about 20 seconds. The predetermined location of the studs is controlled by the program of the CNC machine so that the studs will align with the through holes 28 of respective dies 14, and so that the dies are positioned such that the engraved surfaces 20 thereof are aligned with the design of the artwork representation on the positive or negative film, or digital file of the design. Thus, there is one stud 32 for each through hole 28, and the axis of each stud 32 is aligned with the axis of a respective

through hole 28. The studs 32 may be of various materials including suitable synthetic resin compositions, and preferably metals. A most preferred material is steel with a coating of copper. Each stud 32 may for example have a 10-32 thread.

**[0034]** The design engraved surface 22 of each die 14 has a counter bored cavity 34 coaxial with a respective through hole 28. The cavities 34 are of sufficient diameter to clear an internally threaded nut 36 removably threaded over a respective stud 32 after a corresponding die plate 14 has been placed on the die receiving surface 16 of support plate member 12. As is evident from Fig. 4, the nuts 36 are each of limited height such that when threaded over corresponding studs 32 and brought into engagement with the plate 14 at the bottom of cavities 34, the uppermost surface of each nut is below the unengraved surface of the die plate 14. The CNC machine is also programmed to shave off excess material from the upper end of each of the studs 32 so that the upper extremity of each stud likewise is below the adjacent upper surface of die plate 14. The same procedure is used in the case of fabrication of a curved support plate for a rotary press platen wherein a computer program, except that the program functions to convert the flat engraved image surfaces into altered cylindrical image surfaces that correspond to the requisite flat image on a substrate brought into engagement with the curved die.

**[0035]** After hand, pantograph, laser or etch engraving of the die blank, or during engraving of each die plate 14 by the programmed CNC machine and drilling of through holes 28, the CNC machine also drills at least two alignment apertures 38 in the plate 14 outboard of the engraved image 20 of the die plate. The support plate program for the CNC machine drills orifices 40 in the support member 12 that directly align with apertures 38 in a respective die plate 14. Thus, the program for the CNC machine is functional to locate apertures 38 and corresponding orifices 40 in positions correlated and coordinated with the design on the film positive, negative or digital file representation of the design to be foil stamped, embossed or die cut. Similarly, the program that converts flat surface representations to rotary surface representations is utilized to compensate for the rotary die surface as opposed to a flat die surface.

**[0036]** It is preferred that the program for the CNC machine also mill a series of hold down slots 42 in support member 12 in disposition such that the slots do not underlie one of the die plates 14 positioned on and secured to support member 12. Each slot is adapted to receive a toggle device 44 or other equivalent fastener that serves to firmly hold the portion of the support member 12 surrounding a respective slot firmly against a flat bed press chase or rotary press chase on which the support plate 12 is mounted, with two fasteners such as toggle devices 44 preferably being provided at opposite ends of the elongated slots 42. As can be seen from Fig. 6, each toggle device 44 has an uppermost, eccentrically located disc portion 46 configured to overlie and engage an adjacent segment of the slot in the support member. The toggle devices 44 are adapted to be received in an adjacent aperture 48 of the chase 50 on which the assembly 10 is mounted. The body of the toggle device 44 received in a respective aperture 48 of chase 50 and preferably has end-to-end components as shown in Fig. 8 presenting interengaging beveled surfaces such that when the length of the device is decreased by turning of a suitable connecting screw to move the components toward one another, the result is an increase in the effective diameter of the toggle device so that it is locked in a respective aperture 48 and will not move with respect to the chase 50. It can also be seen from Fig. 6 that toggle devices 44 are useful to hold down the perimeter of support member 12 by virtue of the fact that the disc portion of each toggle device lays over and engages the perimeter edge of support member 12.

**[0037]** As is evident from Fig. 7, chase 50 is a normally stationary part of, for example, a flat bed press 52 having a reciprocable platen 54 moveable toward and away from the chase 50 as sheets to be foil stamped, embossed or die cut are inserted therebetween.

**[0038]** After engraving, edge milling and drilling of each of the die plates 14, and following surface shaving, edge and slot milling, and stud welding of the support plate 12, the individual die plates 14 are placed over respective studs, alignment pins are introduced into aligned apertures 38 and orifices 40, and nuts 36 are threaded over respective studs 32 until the nuts are in firm engagement with each die plate 14 at the bottom of cavities 34. The alignment pins may thereupon be removed from aligned apertures 38 and orifices 40. The completed graphic arts die assembly 10 is ready to be shipped to a user. The operator of a flat bed stamping, embossing or die cutting press may mount the flat assembly 10 shown in Figs. 1-8 of the drawings, directly on the chase of the flat bed press. The edge 18 of the support member 12 may be used as a guide for location of the assembly 10 in view of the fact that the edge 18 is precisely located with respect to the center point of support member 12, with the individual dies 14 being precisely positioned with respect to that center point of the support member 12. If adjustment of any of the die plates 14 is required during makeready of the press because of differences in substrate, processing conditions such as humidity in the press area affecting the substrate, or other factors often encountered in processing operations, die adjustment may be easily accomplished without removing the dies from the support member 12. All that is required is loosening of nuts 36, incremental shifting of the die plate, followed by re-tightening of nuts 36.

**[0039]** Rotary press components forming a part of a rotary foil stamping, embossing, or die cutting press are shown in Fig. 9 and are broadly designated by the numeral 156. The cylindrical chase 150 mounted on roller 158 has a plurality of apertures 148 similar to the apertures 48 of chase 50. The chase 150 is in direct opposition and mates with an anvil roller 160 which may have a

blanket roll 162. Conventional intermeshing gears 164 and 166 at the ends of cylinder 158 and roller 160 respectively are provided to effect rotation of cylinder 158 and roller 160 from a single drive shaft.

**[0040]** The semi-cylindrical support member 112 of the die assembly 110 is preferably made from a steel tube. This tube is ground to a desired thickness of for example 1,52 cm (0.060 in.), after which the CNC program is used to control a laser cutting machine to cut the final die support member. The semi-cylindrical die support member 112 may also be fabricated from a flat steel plate that is shaved to desired uniform thickness and then bent into circular configuration with conventional roll forming equipment. The support member 112 may be prepared from a tube as described, or constructed from a flat member that is shaved with a CNC machine. A flat surfaced support member is then bent with a die former into circular configuration. The curved die plates 114 are also of identical construction to plates 14 with the exception that each die plate 114 is preferably fabricated from a metal cylinder of a diameter generally of the same diameter as the exterior face of chase 150. A semi-cylindrical segment blank is cut from a metal cylinder such as brass, copper, steel, magnesium, zinc, or other engravable material having dimensions slightly larger than the final die plate. If, for example, the metal cylinder used has a thickness of about 12,7 mm (½ in.), the thickness of the segment blank is reduced to approximately 6,35 mm (¼ in.) by the CNC machine in the same operation that the design image is formed in the outermost face of the metal blank. The normally innermost surface of the curved die plate is machined with precision so that it will closely conform with the outer curved die supporting surface of the semi-cylindrical support member 112.

**[0041]** The CNC machine is also programmed to form through holes in each of the die plates 114 similar to the through holes 28 in die plate 14, and to form alignment holes in each of the die plates 114 outboard of the image defining design surface of each curved die plate. The through holes in die plates 114 align with orifices in support member 112 similar to orifices 40 in support plate 12. The through holes formed in each die plate 114 are coaxial with nut clearing cavities 134 in the outer design defining surface of each die plate 114.

**[0042]** The CNC machine is programmed to weld a series of studs 132 to the outer design receiving surface 116 of support plate 112 in disposition such that the studs 132 will be in coaxial alignment with respective through holes in the die plates 114 when the die plates are mounted in respective positions on support plate 112.

**[0043]** As can be observed in Fig. 10, the die receiving surface 116 of the support number 112 may have a circular recess 168 for each stud 132 with the lowermost extremity of each stud 132 being positioned within a corresponding recess. Welding of studs 132 while inserted into a corresponding recess 168 increases the physical connection of each stud 132 to the support member 112, so that the studs are better able to withstand tortional forces imparted to the studs during rotation of the cylinder 158 supporting chase 150.

**[0044]** In alternate embodiments of the support plate 112, each stud 132 may be secured to the support plate 112 by press fitting each stud from the back of the support plate 112 through a complemental opening in support plate 112. The part of the studs 132 extending through member 112 may have enlarged conical heads complementally received in corresponding conical hole segments of the support member 112 to further increase the holding power of each stud 132. Cylindrical studs extending through the support member 112, or the conical headed studs 132 may, if desired, be welded, braised, or chemically bonded as with an adhesive to the support member 112. The upper extremities of each of the studs 132 should be shaved if necessary so that the upper end of each stud does not project above the outer design defining surface of a respective die plate 114.

**[0045]** Toggle devices 144, preferably of the same construction as toggle devices 44, are received in respective slots 142 in support member 112. One toggle device 144 is illustrated in each of the slots 142 in Fig. 10, as being representative, but it is to be understood that in preferred construction, two toggle devices 144 will be provided in a respective slot 142, with the toggle devices 144 being located at corresponding ends of slots 142. To that end, the support member 112 is positioned such that the toggle devices will be received in a respective aperture in the chase 150. Toggle devices 144 function in the same manner as toggle devices 44 in slots 42 of support member 12 to hold the interior portion of support member 112 in firm contact with chase 150. Additional toggle devices 144 received in respective apertures of chase 150 are used to attach the peripheral edge of support member 112 to the curved surface of chase 150.

**[0046]** The individual die plates 114 are placed on curved support member 112 with the studs 132 received in respective through holes in corresponding die plates 114. Pins are temporarily inserted through the alignment holes in die plates 114 and the alignment apertures in support member 112. Nuts 136 are threaded on each stud 132 and tightened against the outer surface of each die plate 114 within respective cavities 134. The curved die plate and support member assembly is ready to be delivered to a customer for mounting as a unit on the cylindrical chase 150 of the rotary press. Limited movement of each of the die plates 114 for final registration of each die plate is permitted upon loosening of respective nuts 136, and the nuts all retightened after a respective die plate has been repositioned to a desired registered location.

**[0047]** The operation of the rotary press is essentially the same as described with respect to the flat bed press, with the exception that a substrate web is fed to the rotary press instead of individual sheets being fed to the flat bed press.

**[0048]** Makeready time for a rotary press set up to foil

stamp, emboss or die cut is substantially reduced as compared with a conventional rotary press because of the provision of a preshaped curved support member and a reformed semi-circular die plate releasably and removably affixed to the support members. Significantly less operator time is required to prepare a rotary press for foil stamping, embossing or die cutting using the present invention, because the dies are all mounted as a unit on the support member while being maintained in proper registration relative to one another.

Example

**[0049]** In accordance with the present invention the support member 12 is preferably a steel plate in which the die receiving surface 16 has been shaved in a milling machine such that the plate thickness is from about 0,762 mm (0.030 in.) to about 2,54 mm (0.100 in.) thick, more preferably from about 1,02 mm (0.040 in.) to about 2,29 mm (0.090 in.), and most preferably 1,52 mm (0.060 in.). The thickness of the die plate 14 should be in the range of from about 3,81 mm (0.150 in.) to about 5,59 mm (0.220 in.), more preferably from about 4,06 mm (0.160 in.) to about 5,33 mm (0.210 in.) and most preferably about 4,83 mm (0.190 in.). The overall thickness of assembly 10 is most preferably about 6,35 mm (0.250 in.), in order to comply with industry practice in North America that a foil stamping, embossing or die cutting plate should be no more than about 6,35 mm (0.250 in.) thick. In the instance of foreign press operations, the total overall thickness of assembly 10 should typically be no more than about 7 mm. in accordance with foreign foil stamping, embossing and die cutting industry practice. In lieu of being made of steel, the support member 12 may be fabricated from a metal other than carbon steel, e.g. copper, brass, titanium, or stainless steel. Cladded metal plate material comprising two metal layers, including respective layers of copper, brass, zinc, and magnesium combined with a different metal such as steel may be used in which one layer of a metal is utilized with a different metal. Utilization of a cladded metal plate for fabrication of support member 12 has the advantage that because of the manner in which cladded metal sheets are produced by passage of the metal overlying layers between rollers which apply very high pressures to the laminated plate material. The opposing surfaces of the resultant cladded metal plate are in very precise parallelism, thus in most instances negating the necessity of shaving one surface of the plate material used to fabricate the support member.

**[0050]** Preferably each of the through holes 28 is approximately from about 5,08 mm (0.200 in.) to about 6,86 mm (0.270 in.) and preferably about 6,35 mm (0.250 in.) in diameter while each stud has a diameter of about 4,75 mm (0.187 in.) and is about 3,56 mm (0.140 in.) in height. The nuts 36 are the diameter of a standard 9,53 mm (3/8 in.) nut, have 10-32 threads, and are 2,41 mm (0.095 in.) thick. Cavities 34 are counter bored to a depth of at least 2,54 mm (0.100 in.). It is preferred in this respect that the dimensions of the through holes 28 and studs 32 be correlated such that the die plate 14 may move in all directions a distance relative to the studs 32 therein within the range of about 0,254 (0.010 in.) to about 1,27 mm (0.050 in.), and preferably about 0,762 mm (0.030 in.).

**[0051]** The die plate 14 may be any ferrous or non-ferrous metal including copper, zinc, magnesium, aluminum, steel, brass, or a composite material including thermoplastic and thermoset resins. Although, copper coated steel studs are preferred, the studs may also be fabricated of any ferrous or non-ferrous weldable material including stainless steel or copper. In lieu of welding the individual studs to the support member for the die plate, the studs may be threaded elements that are press fitted, adhesively bonded or chemically bonded to the support member 12. Another alternative for studs 32 are posts having means such as a groove in the upper end thereof for receipt of an annular fastener. Preferably there should be a stud 32 for every four to seven square inches of an engraved die, with a minimum of two studs per die.

**[0052]** In the case of a die assembly 110 for use on a rotary press the thickness of the support member 112, nominally should range from about 0,762 mm (0.030 in.) to about 2,54 mm (0.100 in.), more preferably from about 1,02 mm (0.040 in.) to about 2,29 mm (0.090 in.), and most preferably about 1,52 mm (0.060 in.). The thickness of the die plate 114 should be from about 4,14 mm (0.163 in.) to about 5,92 mm (0.233 in.), more preferably from about 4,39 mm (0.173 in.) to about 5,92 mm (0.233 in.) and most preferably about 5,16 mm (0.203 in.). The overall thickness of the combination of the support member 112 and a respective die 114 is most preferably about 6,68 mm (0.263 in.).

**[0053]** Use by a press operator of the present graphic arts assembly 10 or 112 in lieu of preexisting lock-up procedures for foil stamping, embossing or die cutting dies individually mounted directly on a flat bed chase or rotary cylinder chase can reduce lock-up time by as much as 400% or more, thus decreasing not only makeready time but also significantly lowering the cost of die lock-up and press makeready. b. Preferred Embodiments of a Series of Curved Die Carrier Plates for One or More Curved Dies and Adapted to Be Mounted on a Rotary Press Cylindrical Chase.

**[0054]** The cylindrical chase 250 illustrated in Fig.11 of the drawings mounted on roller 258 is similar to the chase 150 as shown in Fig. 9, and has a large number of smooth bored apertures 248 around the circumference of the chase. The chase 250 is adapted to run in opposition to blanket roll 262 carried by anvil roller 260. Conventional intermeshing gears 264 and 266 at the ends of roller 258 and roller 260 respectively effect rotation of cylindrical chase 250 and blanket roll 262 in unison from a single drive shaft.

**[0055]** The die support assembly unit 210 comprises a plurality of curved die support plate members 212 that receive at least one arcuate die 214 complementally at-

tached to the outer surface of a respective support plate 212. Although the die support plates 212 of Fig. 11 have only one die 214 thereon, it is to be understood that a multiplicity of dies 214 may be provided on each die support plate 212 depending upon the number of images in the artwork design. Furthermore, although the die support plates 212 shown in Fig. 11 are of the same width in a direction circumferentially of the chase 250. It is to be understood, though, that the die support plates 212 may each be of varying circumferential width and longitudinal length, provided that required registration is maintained between the die support plates 212 and with respect to the chase 250.

**[0056]** Each of the die support plates 212 are secured to the cylindrical chase 250 in the same manner as the components for releasably affixing the support plate 112 to the periphery of chase 150 as shown in Fig. 9. Thus, each die plate 212 is preferably provided with at least a pair of elongated slots 242 adjacent proximal opposed margins of respective support plates 212. Fasteners 244, similar to toggle devices 44 and 144, are used to releasably affix the die support plates 212 to cylindrical chase 250. Each of the toggle devices 244 is designed to be received within a corresponding aperture 248 in chase 250. Although only one toggle device 244 is shown in each of the slots 242 in Fig. 11, it again is to be understood that in a preferred arrangement, two toggle devices 244 will be provided for each slot 242, with the toggle devices 244 being located at respective opposite ends of corresponding slots 242. It can be seen in Fig. 11, that a toggle device 244 is provided in each of the slots 242, while other toggle devices 244 engage the opposed outermost edges of the die support plates 212.

**[0057]** Fasteners 244, which are the same as or similar to fasteners 144 and that secure dies 114 to die support plate 112, are provided for attaching dies 214 to each of the die support plates 212. It can be seen from Fig. 11 that each of the die plates 214 has a plurality of openings 230 that receive respective studs 232 constructed and mounted in a manner as described with respect to studs 32 mounted on support plate 12. Nuts 236 are threaded over the outermost ends of studs 232. The artwork template or film that is used to program the equipment for fabrication of each support plate 212 by drilling holes such as holes 40 illustrated in Fig. 2, that are locating apertures for positioning of the dies 214 on respective support plates 212. At least two alignment apertures 238 are provided in each of the die support plates 212 for temporary receipt of an alignment pin that is adapted to be complementally received in a corresponding alignment aperture, such as holes 40, formed in each support plate 212. Nuts 236 are tightened down after each die 214 is oriented in its proper position by use of the alignment pins, whereupon the pins are removed from the apertures 238 and underlying holes 40.

**[0058]** The metal material used and the steps for fabricating support plates 212 and dies 214 are the same as previously described with respect to plates 12 and 112. Thus, as described with respect to plates 12 and 112, and based on the artwork template or film provided by the user of the die plate assemblies, the location of the alignment apertures in support plates 212 and corresponding alignment apertures 238 in support plates 212 are determined and appropriate holes drilled in the plates 212 and the dies 214. Similarly, the artwork template or film is used to determine the location of the openings 230 which receive studs 232 for affixation of the dies 214 to respective semi-cylindrical support plates 212.

**[0059]** As shown in Figs. 11 and 14, the margins 268 of each die support plate 212 that are opposed and adjacent to one another as mounted on the cylindrical chase 250, have rectangular notches 270 of the same shape and size. From Fig. 11 it can be seen that there are at least two notches in each margin 268 of the die support plates 212, while three or more notches 270 may be provided in the longer margins of die support plates 212, depending upon the length of a respective plate 212. Each of the notches 270 defines a rectangular opening 272. The notches 270 in respective edges of the die support plates 212 are located such that a pair of notches 270 of adjacent die support plates 212 are adapted to align and cooperate to define a rectangular opening 272 that is adapted to receive the operating end of a spacing and alignment tool 274. From Figs. 13-15, it can be seen that the tool 274 has an elongated stem 276 that is rectangular in cross-section. The lowermost end of the stem 276 has two opposed, unitary, outwardly-directed rectangular projections 278 and 280 that define a spacing head 282. It is to be seen from Fig. 13, that the head 282 is spaced above the bottom surface 284 of the stem 276 of stem 274. The length of the stem 274 below head 282 is preferably slightly less than the thickness of the plate 212 so that bottom surface 284 of stem 276 does not contact the face of cylindrical chase 250. It is also preferred that a plurality of the tools 274 be provided, with a minimum of two tools 274 being available.

**[0060]** Fig. 26 is a schematic representation of one of the die support plates 212a illustrated as a flat plate for simplicity, although it is to be understood that the plate will be of arcuate configuration as shown in Fig. 11. The plate 212a preferably has a registration line 286 scribed in what will be the outer surface 212' of the plate. The line 286 is used for alignment of the plate 212a with a similar scribed, circumferentially extending line or marker in the outer face of cylindrical chase 250 when the plate 212a is attached to chase 250. It is required that only one of the die support plates 212, designated as plate 212a in Fig. 26, be provided with a registration line or marker.

**[0061]** The program that fabricates the die support plate 212a and that scribes the line 286 in a predetermined position on the plate 212a, also locates the openings 238 for alignment of dies 214 on plate 212a, so that when an individual die 214 is attached to the plate 212a, or in the alternative a plurality of dies are mounted on plate 212a, the dies are thereby registered with the line 286 and similarly with respect to the center line of the

cylindrical chase 250. The remaining die support plates 212 mounted on the cylindrical chase 250 in association with the plate 212a, are aligned with plate 212 using tools 274 positioned in respective openings 272 defined by opposed aligned notches 270. Viewing Fig. 11, if the die support plate 212a is the support plate in the upper left hand quadrant of the four plates, and the die support plate 212a has been secured to the cylindrical chase 250 using toggle devices 244, the die support plate 212b in the upper right hand quadrant of Fig. 11 is positioned in registration with plate 212a by placement of the head 282 of each of the tools 274 in a corresponding opening 272 of aligned notches 270. As previously noted, the tools 274 serve to not only align the plate 212b with plate 212a, both circumferentially and axially of the cylindrical chase 250, but also maintain a predetermined space between plate 212a and plate 212b. This spacing between the adjacent plates 212a and 212b compensates for expansion of the plates 212 upon heating of the press cylinder, while maintaining the dies 214 in registration with the images on the substrate passed between the two cylinders of a press. The plate 212c is aligned with plate 212a using tools 274 in the manner previously described, whereupon plate 212d is aligned with plates 212b and 212c, again using tool 274. Each of the plates 212b, 212c, and 212d are secured to the cylindrical chase 250 with respective toggle devices 244. The sequence of alignment and attachment of plates 212b, 212c, and 212d to the cylindrical chase 250 may be changed as desired by the press operator.

**[0062]** As shown in Fig. 27, the plate 212a may have a pair of registration lines 286a and 286b that are in alignment, in lieu of a single line 286 a shown in Fig. 26. Similarly, the registration line may be offset from the center of the plate as indicated by the line 286c in Fig. 28. The only requirement is that the registration line or marker on the plate 212a be located such that the plate 212a will be positioned in predetermined relationship to the center line of the cylindrical chase 250 when the plate 212a is attached to the chase 250.

**[0063]** In order to assure that plates 212 are all attached to cylindrical chase 250 in proper positions, one with respect to the other, the edges of plates 212 that are in adjacent relationship after assembly of the plates 212 on cylindrical chase 250, one adjacent edge of one of the plates 212 is provided with a projecting polarization tab 288 that is adapted to be received in a corresponding notch 290 in the opposed edge of a proximal plate 212, as shown in Fig. 17. It is to be understood in this respect that the tabs 288 and corresponding notches 290 are positioned in locations such that the plates 212 can be placed on cylindrical chase 250 in only one relative assembled orientation.

**[0064]** In the alternative die support assembly unit 310 illustrated in Figs. 18 and 19, the die support plate members 312 are each provided with a plurality of rectangular cutouts 316 located in general surrounding relationship to each die 314 mounted on the outer surface of a respective support plate member 312. Viewing Fig. 18, it is to be seen that two cutouts 316 are provided in association with each of the edge portions 314a, 314b, 314c, and 314d of rectangular die 314. It is to be understood in this respect that each of the cutouts is located such that a portion of the cutout underlies a corresponding edge portion of the die 314. Thus, a tool in the nature of a conventional screwdriver 318 may be used to adjust the position of a die 314 with respect to the underlying die support plate member 312 by inserting the blade tip 320 of screwdriver 318 in one of the cutouts 316. Each die 314 is initially attached to the die support plate member 312 using nuts 336 threaded over studs 332, after pins have been inserted in the apertures 338 and extending into corresponding alignment openings, such as openings 40, in the underlying support plate member 312. In order to permit slight lateral adjustment of a die 314 as may be desired using the screwdriver tool 318 as shown in Fig. 19, the nuts 336 threaded over studs 332 projecting upwardly from the surface of die plate support member 312 are slightly loosened.

**[0065]** In a further alternative die and support assembly unit 410 shown in Figs. 20 and 21, a plurality of circular cutouts 416 are provided in the die support plate member 412 in lieu of rectangular cutouts 316 in the die support plate 312. Two cutouts 416 are located outboard of the peripheral edge portions 414a, 414b, 414c, and 414d of rectangular die 414. It can be seen from Fig. 20 that each of the circular cutouts 416 is positioned in spaced relationship from a corresponding edge portion of die 414. A special tool 418 as depicted in Fig. 22 is provided for shifting die 414 laterally of a respective die support plate member 412. The tool 418 has a shaft 420 connected to a handle 422. The outer extremity of shaft 420 is provided with a cylindrical cam head 424 in which the axis of the head is offset from the axis of shaft 420 causing the cam surface 426 of head 424 to be eccentric with respect to the shaft axis. A cylindrical button 428 on the lowermost face 430 of head 424 is of the same diameter as each cutout 416, and is coaxial with shaft 420. The distance from the axis of button 428, and therefore the axis of shaft 420, to the outermost face of cam surface 426 is somewhat greater than the distance between the center of each cutout 416 and the adjacent peripheral edge portion 414a-d of die 414 when the die is mounted on support plate member 412 after having been affixed to plate member 412 through use of pins inserted into apertures 43 8 aligned with underlying apertures in the die support plate member 412.

**[0066]** When it is found necessary to slightly move a die 414 relative to the underlying die support plate member 412 in order to align the die surface with the image on the substrate, the nuts 412 are loosened slightly on respective studs 432, the button portion 428 of eccentric head 424 is inserted in a selected circular cutout 416, and the tool 418 rotated to bring the surface 426 of head 424 into engagement with a respective edge portion 414a-d of die 414. Continued rotation of tool 418 serves

to slightly shift die 414.

**[0067]** The alternative die plate support member and die assembly unit 510 depicted in Figs. 23-25 has die plate support members 512 that are especially adapted for mounting on a cylindrical chase 550 that differs from chase 250 in that the chase 550 has alternate rows of smooth bore apertures 548 and threaded apertures 552. It can be seen from Fig. 23 that the apertures 552 are of smaller diameter than apertures 548 and are offset from the apertures 548. The apertures 548 and 552 of cylindrical chase 550 are arranged in a matrix X-Y grid pattern where there is a predetermined distance laterally and vertically between adjacent apertures. Information is entered into a computer program that is indicative of the X-Y coordinate positions and relative distances between adjacent apertures.

**[0068]** That program with information as to the positions and relative spacing of the apertures 548 and 552 is then used to program equipment for fabrication of the individual die support plate members 512. During that fabrication process, a series of elongated alignment openings 534 are formed along the edge portion of each of the die plates 512. Although only one alignment opening 534 in each die plate 512 is illustrated in Fig. 23, it is to be understood that a plurality of the elongated openings 534 are provided across the width of a respective die plate.

**[0069]** Each die plate 512 also has a plurality of die plate alignment apertures 538 (only one of which is illustrated in Fig. 23). The positions of the openings 534 and apertures 538 are established by the desired location of each die plate 512 based on the coordinates of the pattern of smooth bore apertures 548 in the cylindrical chase 550. The openings 534 and apertures 538 receive alignment pins 590 that are received in a corresponding underlying smooth bore aperture 548 in cylindrical chase 550. This die support plate alignment procedure is carried out with respect to all of the die support plates 512. In Fig. 23, the die support plate 512a that is intended to be in closest relationship to the gripper of the cylindrical chase 550 has the designation "GRIPPER" on the plate for orientation and identification purposes. It is to be recognized in this respect that there may be more than one support plate 512a across the width of the cylindrical chase 550 if desired.

**[0070]** During fabrication of each support plate 512, each plate is provided with alignment openings that are designed to align with apertures 548 in respective dies 514 so that pins inserted in apertures 548 and the underlying openings in a corresponding die support plate 512 provide for proper positioning of each die plate 514 on its corresponding support plate 512. After pin alignment of each die 514 on the support plate 512, nuts 536 are tightened on respective studs 532 secured to the plate 512 in order to affix each die to its support plate.

**[0071]** The support plates 512 may also be provided with rectangular cutouts 516 similar to cutouts 316 in plates 312, for minute adjustment of the dies 514 using a tool such as a screwdriver 318 as previously described with respect to unit 310.

**[0072]** Support plates 512 are preferably secured to the cylindrical chase 550 by screws 592 that extend through openings 596 therefor in support plate 512 and that thread into an underlying threaded aperture 552. The plates 512 may optionally be provided with elongated slots 594, which correspond to the slots 242 in plates 212, allowing plates 512 to be secured to a cylindrical chase 250 of the type illustrated in Fig. 11 using fasteners such as the toggle devices 244 received in the slots 594. When each plate 512 is mounted on a cylindrical chase such as chase 250, toggle devices 244 are also used to secure the edges of the plate 550 to the surface of the chase. Accordingly, plates 512 may be mounted on a conventional cylindrical chase of the type designated by 250, as well as a cylindrical chase such as 550 having alternate threaded and smooth bore mounting apertures. This is an advantage because one model of support plate may be provided for mounting on whatever type of press chase is in use.

**[0073]** An important advantage of the support plates 512 is the fact that by using a coordinate system for mounting the plates 512 on any one of two different types of apertured cylindrical chases of a rotary press, the computer program used to control fabrication of each support plate as well as the dies to be mounted on that plate, has all of the coordinate information necessary to assure that the alignment functions of the plate as well as the die are maintained for each production job, resulting in efficiency of fabrication and more accurate products.

## Claims

**1.** A graphic arts die assembly (10,110,210,310, 410,510) adapted to be mounted as a unit on the apertured chase (50) of a flat bed press or the apertured cylindrical chase (150,250,550) of a rotary graphic arts press, said assembly comprising:

a plurality of dies (14,114,214,314,414,514) each having a stamping, embossing or die cut surface (22) and an opposed mounting surface;

a die support member (12,112,212,312,412, 512) for the dies (14,114,214,314,414,514), said member (12,112,212,312,412,512) having a die receiving surface (16,116) and an opposed surface (30) engageable with the chase (50) of a flat bed press or the chase (150,250,550) on the cylinder of a rotary press,

the plurality of graphic arts dies (14,114,214, 314,414,514) being mounted on said die receiving surface (16,116) of the die support member (12,112,212,312,412,512) in predetermined relative positions;

a plurality of upstanding die fasteners (32,132, 232,332,432,532) secured to the die receiving

surface (16,116) of the die support member (12,112,212,312,412,512), there being at least two fasteners (32,132,232,332,432,532) for each die (14,114,214,314,414,514),
each of the dies (14,114,214,314,414,514) having a through hole (28,230) positioned to receive a respective fastener (32,132,232,332,432,532) therein; and
a releasable connector (36,136,236,336,436,536) on each fastener (32,132,232,332,432,532) engaging a respective die (14,114,214,314,414,514) for maintaining each die (14,114,214,314,414,514) in a fixed position on the die support member (12,112,212,312,412,512);
**characterized in that**
the fasteners (32,132,232,332,432,532) received in the through holes (28,230) of a respective die (14,114,214,314,414,514) are positioned in predetermined relationship with respect to and outboard of the design defining surface (20) of that die (14,114,214,314,414,514) and that
the design defining surface (20) of each die (14,114,214,314,414,514) conforms to the design image of prepared artwork.

**2.** An assembly as set forth in claim 1, **characterized in that** each of said holes (28,230) is of a size greater than the thickness of the fastener (32,132,232,332,432,532) received therein, sufficient to allow movement of each die (14,114,214,314,414,514) relative to the fasteners (32,132,232,332,432,532) for that die (14,114,214,314,414,514) and with respect to the support member (12,112,212,312,412,512) when the connectors (36,136,236,336,436,536) of a respective die (14,114,214,314,414,514) are released from fixed engagement with the die (14,114,214,314,414,514).

**3.** An assembly as set forth in claim 1, **characterized in that** each of said fasteners (32,132,232,332,432,532) is a threaded stud and each of the connectors (36,136,236,336,436,536) is rotatively threaded onto a respective stud.

**4.** An assembly as set forth in claim 3, **characterized in that** each of said connectors (36,136,236,336,436,536) is a nut threaded onto a respective stud.

**5.** An assembly as set forth in claim 3, **characterized in that** each of the design defining surfaces (20) of the dies (14,114,214,314,414,514) are provided with a relief cavity (34,134) aligned with a respective through hole (28,230) in each die (14,114,214,314,414,514) and sized to receive a connector (36,136,236,336,436,536) threaded onto a corresponding stud.

**6.** An assembly as set forth in claim 5, **characterized in that** each of said cavities (34,134) is of a depth at least about equal to the thickness of a respective connector (36,136,236,336,436,536) threaded onto a corresponding stud.

**7.** An assembly as set forth in claim 1, **characterized in that** the plurality of dies (14,114,214,314,414,514) are mounted on the support member (12,112,212,312,412,512) in disposition conforming the positions of a plurality of design image artwork.

**8.** An assembly as set forth in claim 1, **characterized in that** said support member (12,112,212,312,412,512) has a perimeter edge (18), said support member (12,112,212,312,412,512) being provided with at least one support member hold down slot (42,142,242,594) spaced from said edge (18) of the support member (12,112,212,312,412,512) for receiving a device (44,144,244) engageable with the support member (12,112,212,312,412,512) and the chase (50) of a flat bed press or the chase (150,250,550) of a rotary press on which the support member (12,112,212,312,412,512) is mounted to hold the portion of the support member (12,112,212,312,412,512) surrounding the hold down slot (42,142,242,594) in substantial conforming contact with the adjacent area of a respective chase (50,150,250,550).

**9.** An assembly as set forth in claim 8, **characterized in that** is provided a plurality of spaced hold down slots (42,142,242,594) in the support member (12,112,212,312,412,512) for receiving respective devices (44,144,244) and located such that the devices (44,144,244) maintain the support member (12,112,212,312,412,512) in close conforming relationship to the chase (50) of a flat bed press or the cylindrical chase (150,250,550) of a rotary press.

**10.** An assembly as set forth in claim 1, **characterized in that** said support member (112) has a plurality of recesses (168), with each recess (168) receiving an end portion of a respective fastener (132).

**11.** An assembly as set forth in claim 1, **characterized in that** each of the fasteners (32,132,232,332,432,532) is a stud affixed to the die receiving surface (16,116) of the support member (12,112,212,312,412,512).

**12.** An assembly as set forth in claim 11, **characterized in that** each of said studs is of generally cylindrical configuration and of greater height than width.

**13.** An assembly as set forth in claim 11, **characterized in that** the studs are located on the die receiving surface (16,116) of the support member (12,112,

212,312,412,512) in predetermined relationship in accordance with digitized program derived from and conforming to design artwork.

**14.** An assembly as set forth in claim 1, **characterized in that** said through holes (28,230) in respective dies (14,114,214,314,414,514) are sized relative to the fasteners (32,132,232,332,432,532) received therein allowing movement of a respective die (14,114, 214,314,414,514) with respect to the support member (12,112,212,312,412,512) through a displacement of at least about 1,27 mm (0.050 in.).

**15.** An assembly as set forth in claim 1, **characterized in that** said support member (12,112,212,312, 412,512) is from about 0,762 mm (0.030 in.) to about 2,54 mm (0.100 in.) thick.

**16.** An assembly as set forth in claim 1, **characterized in that** each of said dies (14,114,214,314,414,514) is from about 3,81 mm (0.150 in.) to about 5,59 mm (0.220 in.) thick.

**17.** An assembly as set forth in claim 1, **characterized in that** the combined thickness of each die (14,114,214,314,414,514) and the support member (12,112,212,312,412,512) is about 6,35 mm (0.250 in.).

**18.** An assembly as set forth in claim 1, **characterized in that** the combined thickness of each die (14,114, 214,314,414,514) and the support member (12,112, 212,312,412,512) is about 7 mm.

**19.** An assembly as set forth in claim 1, **characterized in that** each of the said dies (14,114,214, 314,414,514) is from about 4,14 mm (0.163 in.) to about 5,92 mm (0.233 in.) thick.

**20.** An assembly as set forth in claim 1, **characterized in that** the combined thickness of each die (14,114,214,314,414,514) and the support member (12,112,212,312,412,512) is about 6,68 mm (0.263 in.).

**21.** An assembly as set forth in claim 1, **characterized in that** each of the dies (14,114,214,314,414,514) has at least two apertures (38,238,338,438,553) therein and the support member (12,112,212,312, 412,512) has an orifice (40),therein aligned with each die aperture (38,238,338,438,553), the aligned apertures (38,238,338,438,553) and orifices (40) being adapted to receive an alignment tool extending therethrough.

**22.** An assembly as set forth in claim 1, **characterized in that** said support member (12,312,412) and each of the dies (14,314,414) are of planar configuration.

**23.** An assembly as set forth in claim 1, **characterized in that** said die receiving surface (16,116) and said mounting surface (30) of the support member (12,112,212,312,412,512) are parallel throughout the die receiving surface area of the support member (12,112,212,312,412,512).

**24.** An assembly as set forth in claim 1, **characterized in that** said support member (112,212,512) and each of the dies (114,214,514) is of semi-cylindrical, conforming configuration.

**25.** An assembly as set forth in claim 1, **characterized in that** said assembly (10,110,210,310,410,510) comprises:

a plurality of die support plate members (12,112,212,312,412,512) for the dies (14,114, 214,314,414,514), said plate members (12,112, 212,312,412,512) having edge portions (314a, 314b,314c,314d,414a,414b,414c,414d), a die receiving surface (16,116), and an opposed mounting surface (30) engageable with the chase (50) of a flat bed press or the chase (150,250,550) on the cylinder of a rotary press, at least one die (14,114,214,314,414,514) being mounted on each of the die support plate members (12,112,212,312,412,512) in predetermined disposition with respect to the surface of a corresponding die support member (12,1 12,212,312,412,512),

each of said die support plate members (12,112, 212,312,412,512) having an edge portion (314a,314b,314c,314d,414a,414b,414c,414d) that is adjacent the edge portion (314a,314b, 314c,314d,414a,414b,414c,414d) of at least one other die support member (12,112,212, 312,412,512) when the graphic arts die units (10,110,210,310,410,510) are assembled in predetermined relative dispositions on a flat bed press chase (50) or the chase (150,250,550) of a rotary press, said adjacent edge portions (314a,314b,314c,314d,414a,414b,414c,414d) of the die support plate members (12,112,212, 312,412,512) each having notches (270) therein, each of said notches (270) being located in disposition to align to a corresponding notch (270) in an opposed edge portion (314a,314b, 314c,314d,414a,414b,414c,414d) of an adjacent die support plate member (12,112,212, 312,412,512),

each pair of opposed notches (270) cooperating to define an opening (272) for removable reception of a combination alignment and spacing tool (274).

**26.** An assembly as set forth in claim 25, **characterized in that** said notches (270) are of generally rectan-

gular configuration.

**27.** An assembly as set forth in claim 25, **characterized in that** at least a pair of notches (270) is provided in each of said adjacent edge portions (314a,314b, 314c,314d,414a,414b,414c,414d) of the die support plate member (12,112,212,312,412,512).

**28.** An assembly as set forth in claim 25, **characterized in that** a polarization tab (288) is provided on one edge portion (314a,314b,314c,314d,414a,414b, 414c,414d) of a die support plate member (12,112, 212,312,412,512) adjacent the edge portion (314a, 314b,314c,314d,414a,414b,414c,414d) of another die support plate member (12,112,212,312,412, 512), and the adjacent edge portion (314a,314b, 314c,314d,414a,414b,414c,414d) of said another die support plate member (12,112,212,312,412, 512) being provided with a notch (290) located to receive the opposed tab (288), the tabs (288) and corresponding notches (290) receiving the tabs (288) being located in different positions on different die support plate members (12,112,212,312,412, 512).

**29.** An assembly as set forth in claim 25, **characterized in that** at least one of said die support plate members (12,112,212,312,412,512) is provided with registration indicia (286,286a,286b,286c) thereon adapted to be aligned with a mark on the chase (50) of a flat bed press or the cylindrical chase (150,250,550) of a rotary press in order to permit registered orientation of the die support plate member (12,112,212,312, 412,512) with the mark on the chase (50) of a flat bed press or the cylindrical chase (150,250,550) of a rotary press.

**30.** An assembly as set forth in claim 25, **characterized in that** said die plate support members (12,112,212, 312,412,512) are provided with at least one cutout (316,416,516) adjacent the peripheral edge portions (314a,314b,314c,314d,414a,414b,414c,414d) of each die (14,114,214,314,414,514) mounted on the die plate support member (12,112,212,312,412, 512), each cutout (316,416,516) being configured to receive the head of a tool in a position such that manual manipulation of the tool will selectively shift the die (14,114,214,314,414,514) relative to the die support plate (12,112,212,312,412,512).

**31.** An assembly as set forth in claim 25, **characterized in that** each cutout (316,516) is a rectangular opening underlying and projecting outwardly from a respective proximal peripheral edge portion (314a, 314b,314c,314d,414a,414b,414c,414d) of the die (14,114,214,314,414,514), each cutout (316,516) being configured to receive the blade (320) of a tool.

**32.** An assembly as set forth in claim 25, **characterized in that** each cutout (416) is a circular opening adjacent and spaced from a respective proximal peripheral edge portion (314a,314b,314c,314d,414a, 414b,414c,414d) of the die(14,114,214,314, 414,514), each cutout opening (416) being located and configured to receive a cam tool (418) for selective shifting of the proximal die (14,114,214,314, 414,514) in response to rotation of the cam tool (418).

**33.** An assembly as set forth in claim 25, **characterized in that** said assembly (10,110,210,310,410,510) is adapted to be mounted on a rotary press cylindrical chase (150,250,550) having alternate rows of smooth bore (548) and threaded apertures (552), wherein each of said die support plate members (12,112,212,312,412,512) is provided with apertures (538) therein in disposition to be aligned with smooth bore apertures (548) in the cylindrical chase (150,250,550) for removable receipt of alignment pins (590), each of said die support plate members (12,112,212,312,412,512) further being provided with openings (596) therein that receive fasteners, which may be threaded into the threaded apertures (552) in the cylindrical chase (150,250,550) for releasably attaching the die support plate member (12,112,212,312,412,512) to the cylindrical chase (150,250,550).

**34.** An assembly as set forth in claim 33, **characterized in that** said apertures (538) and openings (596) in each of the die support plate members (12,112, 212,312,412,512) are located in dispositions in accordance with an X-Y coordinate matrix that corresponds to the X-Y coordinate matrix of the apertures (548,552) in the cylindrical chase (150,250,550) on which the die support plate members (12,112,212, 312,412,512) are mounted.

**35.** An assembly as set forth in claim 33, **characterized in that** each of said die support plate members (12,112,212,312,412,512) are provided with slots (594), and a series of fasteners, said slots (594) being located to permit attachment of the die support plate members (12,112,212,312,412,512) to a cylindrical chase (150,250,550) in which all of the apertures in the chase (150,250,550) are smooth bored, certain of said fasteners being adapted to extend through the slots (594) into respective aligned chase apertures, and other of the fasteners engaging the periphery of each die support member (12,112,212, 312,412,512) and adapted to extend into aligned chase apertures.

**36.** A method of preparing a graphic arts die assembly (10,110,210,310,410,510) adapted to be mounted as a unit on the apertured chase (50) of a flat bed

graphic arts press or the apertured cylindrical chase (150,250,550) of a rotary graphic arts press, said method comprising the steps of:

forming a stamping, embossing or die cutting operating surface (22) in each of a plurality of dies (14,114,214,314,414,514), each of said operating surfaces (22) conforming to design artwork;
forming at least two through holes (28,230) in each die (14,114,214,314,414,514) located outboard of and in predetermined disposition relative to the operating surface (22) of a respective die (14,114,214,314,414,514);
providing a die support member (12,112,212, 312,412,512) for the dies (14,114,214,314, 414,514) in which the support member (12, 112,212,312,412,512) has a die receiving surface (16,116) and an opposed mounting surface (30) engageable with a flat bed chase (50) or a rotary cylinder chase (150,250,550);
attaching a plurality of fasteners (32,132,232, 332,432,532) to the die support member (12,112,212,312,412,512) and each located relative to one another in disposition to be received in a respective through hole (28,230) of a corresponding die (14,114,214,314,414,514);
positioning the dies (14,114,214,314,414,514) on the support plate (12,112,212,312,412,512) with fasteners (32,132,232,332,432,532) received in respective holes (28,230) in a corresponding die (14,114,214,314,414,514); and
applying a connector (36,136,236,336,436,536) to each of the fasteners (32,132,232,332, 432,532) in disposition releasably engaging a respective die (14,114,214,314,414,514) to fixedly secure each die (14,114,214,314,414,514) to the support member (12,112,212,312, 412,512);
**characterized by** the steps of digitizing design artwork, forming an operating surface (22) on each die (14,114,214,314,414,514) in accordance with the digitized artwork, and locating the through holes (28,230) in each die (14,114,214, 314,414,514) and positioning the fasteners (32,132,232,332,432,532) on the support member (12,112,212,312,412,512) to conform with the digitized artwork.

**37.** A method as set forth in claim 36, **characterized by** the step of successively affixing the fasteners (32, 132,232,332,432,532) to the die support surface (16,116) of the support member (12,112,212,312, 412,512).

**38.** A method as set forth in claim 36, **characterized by** the steps of forming at least one support member hold down slot (42,142,242,594) in the die support member (12,112,212,312,412,512) in disposition spaced from the perimeter edge (18) of the support member (12,112,212,312,412,512).

**39.** A method as set forth in claim 36, **characterized by** the steps of forming through holes (28,230) in the support member (12,112,212,312,412,512) larger than the width of respective fasteners (32,132,232, 332,432,532), and temporarily releasing the connectors (36,136,236,336,436,536) from fixed engagement with the support member (12,112,212, 312,412,512) to an extent to permit shifting of a respective die (14,114,214,314,414,514) with respect to the fasteners (32,132,232,332,432,532) received in through holes (28,230) through that die (14,114,214,314,414,514).

**40.** A method as set forth in claim 36, **characterized by** the steps of forming the support member (112, 212,512) and each of the dies (114,214,514) in complemental semi-cylindrical configuration for mounting on a rotary press apertured cylindrical chase (150,250,550) of the press.

**41.** A method as set forth in claim 36, **characterized by** the steps of providing an indicia in the die support member (12,112,212,312,412,512), and locating the fasteners (32,132,232,332,432,532) with respect to the location of the indicia using an X-Y coordinate matrix based on the indicia location.

**42.** A method as set forth in claim 36, **characterized by** the step of fixing each of the fasteners (32,132,232, 332,432,532) in a predetermined position, and moving the die support member (12,112,212,312, 412,512) through a displacement based on the location of the indicia, and securing each fastener (32,132,232,332,432,532) to the die support member (12,112,212,312,412,512) while fixed in said predetermined position.

**Patentansprüche**

**1.** Grafikwerkzeuganordnung (10, 110, 210, 310, 410, 510), die angepasst ist, um als eine Einheit an dem mit Öffnungen versehenen Rahmen (50) einer Flachbettmaschine oder dem mit Öffnung versehnen zylindrischen Rahmen (150, 250, 550) einer Rotationsgrafikmaschine befestigt zu werden, wobei die Anordnung aufweist:

eine Vielzahl von Werkzeugen (14, 114, 214, 314, 414, 514), von denen jedes eine Stanz-, Präge- oder Ausstanzfläche (22) und eine gegenüberliegende Befestigungsfläche aufweist,
ein Werkzeugtrageelement (12, 112, 212, 312, 412, 512) für die Werkzeuge (14, 114, 214, 314,

414, 514), wobei das Element (12, 112, 212, 312, 412, 512) eine Werkzeugaufnahmefläche (16, 116) und eine gegenüberliegende Fläche (30) aufweist, die mit dem Rahmen (50) einer Flachbettmaschine oder dem Rahmen (150, 250, 550) an dem Zylinder einer Rotationsmaschine in Eingriff gebracht werden kann,
wobei die Vielzahl von Grafikwerkzeugen (14, 114, 214, 314, 414, 514) in vorbestimmten relativen Positionen an der Werkzeugaufnahmefläche (16, 116) des Werkzeugtrageelements (12, 112, 212, 312, 412, 512) befestigt ist,
eine Vielzahl von hochstehenden Werkzeugbefestigungseinrichtungen (32, 132, 232, 332, 432, 532), die an der Werkzeugaufnahmefläche (16, 116) des Werkzeugtrageelements (12, 112, 212, 312, 412, 512) befestigt sind, wobei mindestens zwei Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) für jedes Werkzeug (14, 114, 214, 314, 414, 514) vorhanden sind,
wobei jedes der Werkzeuge (14, 114, 214, 314, 414, 514) eine Durchgangsbohrung (28, 230) aufweist, die angeordnet ist, um eine jeweilige Befestigungseinrichtung (32, 132, 232, 332, 432, 532) in ihr aufzunehmen, und
ein lösbares Verbindungselement (36, 136, 236, 336, 436, 536) an jeder Befestigungseinrichtung (32, 132, 232, 332, 432, 532), das mit einem jeweiligen Werkzeug (14, 114, 214, 314, 414, 514) in Eingriff steht, um jedes Werkzeug (14, 114, 214, 314, 414, 514) in einer festen Position an dem Werkzeugtrageelement (12, 112, 212, 312, 412, 512) zu halten,
**dadurch gekennzeichnet, dass**
die Befestigungseinrichtungen(32, 132, 232, 332, 432, 532), die in den Durchgangsbohrungen (28, 230) eines jeweiligen Werkzeugs (14, 114, 214, 314, 414, 514) aufgenommen sind, in einer vorbestimmten Beziehung in Bezug auf die musterdefinierende Fläche (20) dieses Werkzeugs (14, 114, 214, 314, 414, 514) und außerhalb dieser Fläche angeordnet sind, und dass
die musterdefinierende Fläche (20) jedes Werkzeugs (14, 114, 214, 314, 414, 514) dem Musterbild einer vorbereiteten Vorlage entspricht.

**2.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** jede der Bohrungen (28, 230) von einer Größe ist, die größer als die Dicke der Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) ist, die in diesen aufgenommen sind, und die ausreicht, um eine Bewegung jedes Werkzeugs (14, 114, 214, 314, 414, 514) in Bezug auf die Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) für das Werkzeug (14, 114, 214, 314, 414, 514) und in Bezug auf das Trageelement (12, 112, 212, 312, 412, 512) zu ermöglichen, wenn die Verbindungselemente (36, 136, 236, 336, 436, 536) eines jeweiligen Werkzeugs (14, 114, 214, 314, 414, 514) von einem festen Eingriff mit dem Werkzeug (14, 114, 214, 314, 414, 514) gelöst sind.

**3.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** jede der Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) ein mit einem Gewinde versehener Stift ist und jedes der Verbindungselemente (36, 136, 236, 336, 436, 536) drehend auf einen jeweiligen Stift geschraubt ist.

**4.** Anordnung nach Anspruch 3, **dadurch gekennzeichnet, dass** jedes der Verbindungselemente (36, 136, 236, 336, 436, 536) eine Mutter ist, die auf einen jeweiligen Stift geschraubt ist.

**5.** Anordnung nach Anspruch 3, **dadurch gekennzeichnet, dass** jede der musterdefinierenden Flächen (20) der Werkzeuge (14, 114, 214, 314, 414, 514) mit einer Reliefvertiefung (34, 134) ausgestattet ist, die mit einer jeweiligen Durchgangsbohrung (28, 230) in jedem Werkzeug (14, 114, 214, 314, 414, 514) ausgerichtet und dimensioniert ist, um ein Verbindungselement (36, 136, 236, 336, 436, 536) aufzunehmen, das auf einen entsprechenden Stift geschraubt ist.

**6.** Anordnung nach Anspruch 5, **dadurch gekennzeichnet, dass** jede der Vertiefungen (34, 134) von einer Tiefe ist, die mindestens ungefähr gleich der Dicke eines jeweiligen Verbindungselements (36, 136, 236, 336, 436, 536) ist, das auf einen entsprechenden Stift geschraubt ist.

**7.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Vielzahl von Werkzeugen (14, 114, 214, 314, 414, 514) an dem Trageelement (12, 112, 212, 312, 412, 512) in einer Anordnung befestigt sind, die den Positionen einer Vielzahl von Musterbildvorlagen entspricht.

**8.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Trageelement (12, 112, 212, 312, 412, 512) einen Umfangsrand (18) aufweist, wobei das Trageelement (12, 112, 212, 312, 412, 512) mit mindestens einem von dem Rand (18) des Trageelements (12, 112, 212, 312, 412, 512) beabstandeten Trageelement-Niederhalteschlitz (42, 142, 242, 594) zur Aufnahme einer Vorrichtung (44, 144, 244) ausgestattet ist, die mit dem Trageelement (12, 112, 212, 312, 412, 512) und dem Rahmen (50) einer Flachbettmaschine oder dem Rahmen (150, 250, 550) einer Rotationsmaschine in Eingriff gebracht werden kann, an dem das Trageelement (12, 112, 212, 312, 412, 512) befestigt ist, um den Bereich des Trageelements (12, 112, 212, 312, 412, 512), der den Niederhalteschlitz (42, 142, 242, 594) um-

gibt, in im Wesentlichen anschmiegendem Kontakt mit dem benachbarten Bereich eines jeweiligen Rahmens (50, 150, 250, 550) zu halten.

**9.** Anordnung nach Anspruch 8, **dadurch gekennzeichnet, dass** in dem Trageelement (12, 112, 212, 312, 412, 512) eine Vielzahl von beabstandeten Niederhalteschlitzen (42, 142, 242, 594) zur Aufnahme jeweiliger Vorrichtungen (44, 144, 244) vorgesehen und in der Weise angeordnet sind, dass die Vorrichtungen (44, 144, 244) das Trageelement (12, 112, 212, 312, 412, 512) in eng anschmiegender Beziehung zu dem Rahmen (50) einer Flachbettmaschine oder dem zylindrischen Rahmen (150, 250, 550) einer Rotationsmaschine halten.

**10.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Trageelement (112) eine Vielzahl von Aussparungen (168) aufweist, wobei jede Aussparung (168) einen Endbereich einer jeweiligen Befestigungseinrichtung (132) aufnimmt.

**11.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** jede der Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) ein Stift ist, der an der Werkzeugaufnahmefläche (16, 116) des Trageelements (12, 112, 212, 312, 412, 512) befestigt ist.

**12.** Anordnung nach Anspruch 11, **dadurch gekennzeichnet, dass** jeder der Stifte von einer im Wesentlichen zylindrischen Ausgestaltung und von einer größeren Höhe als Breite ist.

**13.** Anordnung nach Anspruch 11, **dadurch gekennzeichnet, dass** die Stifte an der Werkzeugaufnahmefläche (16, 116) des Trageelements (12, 112, 212, 312, 412, 512) in einer vorbestimmten Beziehung gemäß einem digitalisierten Programm angeordnet sind, das von einer Mustervorlage abgeleitet ist und dieser entspricht.

**14.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Durchgangsbohrungen (28, 230) in jeweiligen Werkzeugen (14, 114, 214, 314, 414, 514) in Bezug auf die in diesen aufgenommenen Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) so dimensioniert sind, dass sie eine Bewegung eines jeweiligen Werkzeugs (14, 114, 214, 314, 414, 514) in Bezug auf das Trageelement (12, 112, 212, 312, 412, 512) durch eine Verlagerung von mindestens ungefähr 1,27 mm (0,050 Inch) ermöglichen.

**15.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Trageelement (12, 112, 212, 312, 412, 512) von ungefähr 0,762 mm (0,030 Inch) bis ungefähr 2,54 mm (0,100 Inch) dick ist.

**16.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** jedes der Werkzeuge (14, 114, 214, 314, 414, 514) von ungefähr 3,81 mm (0,150 Inch) bis ungefähr 5,59 mm (0,220 Inch) dick ist.

**17.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** die kombinierte Dicke jedes Werkzeugs (14, 114, 214, 314, 414, 514) und des Trageelements (12, 112, 212, 312, 412, 512) ungefähr 6,35 mm (0,250 Inch) beträgt.

**18.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** die kombinierte Dicke jedes Werkzeugs (14, 114, 214, 314, 414, 514) und des Trageelements (12, 112, 212, 312, 412, 512) ungefähr 7 mm beträgt.

**19.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** jedes der Werkzeuge (14, 114, 214, 314, 414, 514) von ungefähr 4,14 mm (0,163 Inch) bis ungefähr 5,92 mm (0,233 Inch) dick ist.

**20.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** die kombinierte Dicke jedes Werkzeugs (14, 114, 214, 314, 414, 514) und des Trageelements (12, 112, 212, 312, 412, 512) ungefähr 6,68 mm (0,263 Inch) beträgt.

**21.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** jedes der Werkzeuge (14, 114, 214, 314, 414, 514) in diesem mindestens zwei Öffnungen (38, 238, 338, 438, 553) hat und das Trageelement (12, 112, 212, 312, 412, 512) in diesem ein Loch (40) hat, das mit jeder Werkzeugöffnung (38, 238, 338, 438, 553) ausgerichtet ist, wobei die ausgerichteten Öffnungen (38, 238, 338, 438, 553) und Löcher (40) angepasst sind, um ein Ausrichtwerkzeug aufzunehmen, dass durch diese verläuft.

**22.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Trageelement (12, 313, 412) und jedes der Werkzeuge (14, 314, 414) von einer planaren Ausgestaltung sind.

**23.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Werkzeugaufnahmefläche (16, 116) und die Befestigungsfläche (30) des Trageelements (12, 112, 212, 312, 412, 512) über den gesamten Werkzeugaufnahmeflächenbereich des Trageelements (12, 112, 212, 312, 412, 512) parallel sind.

**24.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Trageelement (112, 212, 512) und jedes der Werkzeuge (114, 214, 514) von einer halbzylindrischen, einander entsprechenden Ausgestaltung ist.

**25.** Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Anordnung (10, 110, 210, 310, 410, 510) aufweist:

eine Vielzahl von Werkzeugtrageplattenelementen (12, 112, 212, 312, 412, 512) für die Werkzeuge (14, 114, 214, 314, 414, 514), wobei die Plattenelemente (12, 112, 212, 312, 412, 512) Randbereiche (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d), eine Werkzeugaufnahmefläche (16, 116) und eine gegenüberliegende Befestigungsfläche (30) haben, die mit dem Rahmen (50) einer Flachbettmaschine oder dem Rahmen (150, 250, 550) an dem Zylinder einer Rotationsmaschine in Eingriff gebracht werden kann,

wobei mindestens ein Werkzeug (14, 114, 214, 314, 414, 514) an jedem der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) in einer vorbestimmten Anordnung in Bezug auf die Fläche eines entsprechenden Werkzeugtrageelements (12, 112, 212, 312, 412, 512) befestigt ist,

wobei jedes der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) einen Randbereich (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) aufweist, der benachbart zu dem Randbereich (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) von mindestens einem anderen Werkzeugtrageelement (12, 112, 212, 312, 412, 512) ist, wenn die Grafikwerkzeugeinheiten (10, 110, 210, 310, 410, 510) in vorbestimmten relativen Anordnungen an einem Flachbettmaschinenrahmen (50) oder dem Rahmen (150, 250, 550) einer Rotationsmaschine montiert sind,

wobei die benachbarten Randbereiche (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) jeweils Vertiefungen (270) in diesen aufweisen, wobei jede der Vertiefungen (270) in einer Anordnung angeordnet ist, um mit einer entsprechenden Vertiefung (270) in einem gegenüberliegenden Randbereich (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) eines benachbarten Werkzeugtrageplattenelements (12, 112, 212, 312, 412, 512) ausgerichtet zu sein,

wobei jedes Paar von gegenüberliegenden Vertiefungen (270) zusammenwirkt, um eine Öffnung (272) zur entfernbaren Aufnahme eines Kombinations-Ausrichtungs- und -Beabstandungswerkzeugs (274) zu bilden.

**26.** Anordnung nach Anspruch 25, **dadurch gekennzeichnet, dass** die Vertiefungen (270) von einer im Wesentlichen recheckigen Ausgestaltung sind.

**27.** Anordnung nach Anspruch 25, **dadurch gekennzeichnet, dass** mindestens ein Paar von Vertiefungen (270) in jedem der benachbarten Randbereiche (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) vorgesehen ist.

**28.** Anordnung nach Anspruch 25, **dadurch gekennzeichnet, dass** ein Unverwechselbarkeitsansatz (288) an einem Randbereich (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) eines Werkzeugtrageplattenelements (12, 112, 212, 312, 412, 512) benachbart zu dem Randbereich (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) eines anderen Werkzeugtrageplattenelements (12, 112, 212, 312, 412, 512) vorgesehen ist, und wobei der benachbarte Randbereich (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) des anderen Werkzeugtrageplattenelements (12, 112, 212, 312, 412, 512) mit einer Vertiefung (290) versehen ist, die angeordnet ist, um den gegenüberliegenden Ansatz (288) aufzunehmen, wobei die Ansätze (288) und die entsprechenden Vertiefungen (290), die die Ansätze (288) aufnehmen, in verschiedenen Positionen an verschiedenen Werkzeugtrageplattenelementen (12, 112, 212, 312, 412, 512) angeordnet sind.

**29.** Anordnung nach Anspruch 25, **dadurch gekennzeichnet, dass** mindestens eines der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) an diesem mit Übereinstimmungskennzeichen (286, 286a, 286b, 286c) versehen ist, die angepasst sind, um mit einer Markierung an dem Rahmen (50) einer Flachbettmaschine oder dem zylindrischen Rahmen (150, 250, 550) einer Rotationsmaschine ausgerichtet zu werden, um eine in Übereinstimmung gebrachte Orientierung des Werkzeugtrageplattenelements (12, 112, 212, 312, 412, 512) mit der Markierung an dem Rahmen (50) einer Flachbettmaschine oder dem zylindrischen Rahmen (150, 250, 550) einer Rotationsmaschine zu ermöglichen.

**30.** Anordnung nach Anspruch 25, **dadurch gekennzeichnet, dass** die Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) mit mindestens einem Ausschnitt (316, 416, 516) benachbart zu den Umfangsrandbereichen (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) jedes Werkzeug (14, 114, 214, 314, 414, 514), das an dem Werkzeugtrageplattenelement (12, 112, 212, 312, 412, 512) befestigt ist, versehen sind, wobei jeder Ausschnitt (316, 416, 516) ausgestaltet ist, um den Kopf eines Geräts in einer Position in der Weise aufzunehmen, dass eine manuelle Betätigung des Geräts das Werkzeug (14, 114, 214, 314, 414, 514) gezielt in Bezug auf die Werkzeugtrageplatte (12, 112, 212, 312, 412, 512) verschiebt.

**31.** Anordnung nach Anspruch 25, **dadurch gekennzeichnet, dass** jeder Ausschnitt (316, 516) eine rechteckige Öffnung ist, die unter einem jeweiligen proximalen Umfangsrandbereich (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) des Werkzeugs (14, 114, 214, 314, 414, 514) liegt und sich von diesem nach außen erstreckt, wobei jeder Ausschnitt (316, 516) ausgestaltet ist, um die Klinge (320) eines Geräts aufzunehmen.

**32.** Anordnung nach Anspruch 25, **dadurch gekennzeichnet, dass** jeder Ausschnitt (416) eine kreisförmige Öffnung benachbart zu und beabstandet von einem jeweiligen proximalen Umfangsrandbereich (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) des Werkzeugs (14, 114, 214, 314, 414, 514) ist, wobei jede Ausschnittöffnung (416) angeordnet und ausgestaltet ist, um ein Nockenwerkzeug (418) zum gezielten Verschieben des proximalen Werkzeugs (14, 114, 214, 314, 414, 514) in Reaktion auf eine Drehung des Nockenwerkzeugs (418) aufzunehmen.

**33.** Anordnung nach Anspruch 25, **dadurch gekennzeichnet, dass** die Anordnung (10, 110, 210, 310, 410, 510) angepasst ist, um an einem zylindrischen Rotationsmaschinenrahmen (150, 250, 550) befestigt zu werden, der abwechselnde Reihen von glatten Bohrungen (548) und mit Gewinde versehenen Öffnungen (552) aufweist, wobei jedes der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) in diesem mit Öffnungen (538) in einer Anordnung versehen ist, um mit glatten Bohrungsöffnungen (548) in dem zylindrischen Rahmen (150, 250, 550) zur entfernbaren Aufnahme von Ausrichtungsstiften (590) ausgerichtet zu werden, wobei jedes der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) in diesem ferner mit Öffnungen (596) versehen ist, die Befestigungseinrichtungen aufnehmen, die in die mit Gewinde versehen Öffnungen (552) in dem zylindrischen Rahmen (150, 250, 550) geschraubt werden können, um das Werkzeugtrageplattenelement (12, 112, 212, 312, 412, 512) lösbar an dem zylindrischen Rahmen (150, 250, 550) zu befestigen.

**34.** Anordnung nach Anspruch 33, **dadurch gekennzeichnet, dass** die Öffnungen (538) und die Öffnungen (596) in jedem der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) in Anordnungen in Übereinstimmung mit einer X-Y-Koordinatenmatrix angeordnet sind, die der X-Y-Koordinatenmatrix der Öffnungen (548, 552) in dem zylindrischen Rahmen (150, 250, 550) entspricht, an dem die Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) befestigt sind.

**35.** Anordnung nach Anspruch 33, **dadurch gekennzeichnet, dass** jedes der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) mit Schlitzen (594) und einer Reihe von Befestigungseinrichtungen ausgestattet ist, wobei die Schlitze (594) angeordnet sind, um eine Befestigung der Werkzeugtrageplattenelemente (12, 112, 212, 312, 412, 512) an einem zylindrischen Rahmen (150, 250, 550) zu ermöglichen, in dem alle der Öffnungen in dem Rahmen (150, 250, 550) glatt gebohrt sind, wobei bestimmte der Befestigungseinrichtungen angepasst sind, um sich durch die Schlitze (594) in jeweilige ausgerichtete Rahmenöffnungen zu erstrecken, und andere der Befestigungseinrichtungen an dem Umfang jedes Werkzeugtrageelements (12, 112, 212, 312, 412, 512) angreifen und angepasst sind, um sich in die ausgerichteten Rahmenöffnungen zu erstrecken.

**36.** Verfahren zur Herstellung einer Grafikwerkzeuganordnung (10, 110, 210, 310, 410, 510), die angepasst ist, um als eine Einheit an dem mit Öffnungen versehenen Rahmen (50) einer Flachbettgrafikmaschine oder dem mit Öffnungen versehenen zylindrischen Rahmen (150, 250, 550) einer Rotationsgrafikmaschine befestigt zu werden, wobei das Verfahren die folgenden Schritte aufweist:

Ausbilden einer Stanz-, Präge- oder Ausstanzarbeitsfläche (22) in jedem einer Vielzahl von Werkzeugen (14, 114, 214, 314, 414, 514), wobei jede der Arbeitsflächen (22) einer Mustervorlage entspricht,

Ausbilden von mindestens zwei Durchgangsbohrungen (28, 230) in jedem Werkzeug (14, 114, 214, 314, 414, 514), die außerhalb der und in einer vorbestimmten Anordnung in Bezug auf die Arbeitsfläche (22) eines jeweiligen Werkzeugs (14, 114, 214, 314, 414, 514) angeordnet sind,

Bereitstellen eines Werkzeugtrageelements (12, 112, 212, 312, 412, 512) für die Werkzeuge (14, 114, 214, 314, 414, 514), bei dem das Trageelement (12, 112, 212, 312, 412, 512) eine Werkzeugaufnahmefläche (16, 116) und eine gegenüberliegende Befestigungsfläche (30) aufweist, die mit einem Flachbettrahmen (50) oder einem Rotationszylinderrahmen (150, 250, 550) in Eingriff gebracht werden kann,

Befestigen einer Vielzahl von Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) an dem Werkzeugtrageelement (12, 112, 212, 312, 412, 512), wobei jede in Bezug auf andere in einer Anordnung angeordnet ist, um in einer jeweiligen Durchgangsbohrung (28, 230) eines entsprechenden Werkzeugs (14, 114, 214, 314, 414, 514) aufgenommen zu werden,

Anordnen der Werkzeuge (14, 114, 214, 314, 414, 514) an der Trageplatte (12, 112, 212, 312,

412, 512), wobei Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) in jeweiligen Bohrungen (28, 230) in einem entsprechenden Werkzeug (14, 114, 214, 314, 414, 514) aufgenommen sind, und

Anbringen eines Verbindungselements (36, 136, 236, 336, 436, 536) an jeder der Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) in einer Anordnung, die lösbar an einem jeweiligen Werkzeug (14, 114, 214, 314, 414, 514) angreift, um jedes Werkzeug (14, 114, 214, 314, 414, 514) fest an dem Trageelement (12, 112, 212, 312, 412, 512) zu befestigen,

**gekennzeichnet durch** die Schritte, eine Mustervorlage zu digitalisieren, an jedem Werkzeug (14, 114, 214, 314, 414, 514) eine Arbeitsfläche (22) gemäß der digitalisierten Vorlage auszubilden und die Durchgangsbohrungen (28, 32) in jedem Werkzeug (14, 114, 214, 314, 414, 514) anzuordnen und die Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) an dem Trageelement (12, 112, 212, 312, 412, 512) zu positionieren, um der digitalisierten Vorlage zu entsprechen.

**37.** Verfahren nach Anspruch 36, **gekennzeichnet durch** den Schritt, aufeinanderfolgend die Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) an der Werkzeugtragefläche (16, 116) des Trageelements (12, 112, 212, 312, 412, 512) zu befestigen.

**38.** Verfahren nach Anspruch 36, **gekennzeichnet durch** die Schritte, mindestens einen Trageelement-Niederhalteschlitz (42, 142, 242, 594) in dem Werkzeugtrageelement (12, 112, 212, 312, 412, 512) in einer Anordnung auszubilden, die von dem Umfangsrand (18) des Trageelements (12, 112, 212, 312, 412, 512) beabstandet ist.

**39.** Verfahren nach Anspruch 36, **gekennzeichnet durch** die Schritte, Durchgangsbohrungen (28, 230) in dem Trageelement (12, 112, 212, 312, 412, 512) auszubilden, die größer als die Breite der jeweiligen Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) sind, und die Verbindungselemente (36, 136, 236, 336, 436, 536) vorübergehend aus einem festen Eingriff mit dem Trageelement (12, 112, 212, 312, 412, 512) in einem Ausmaß zu lösen, um eine Verschiebung eines jeweiligen Werkzeugs (14, 114, 214, 314, 414, 514) in Bezug auf die Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) zu ermöglichen, die in Durchgangsbohrungen (28, 230) **durch** dieses Werkzeug (14, 114, 214, 314, 414, 514) aufgenommen sind.

**40.** Verfahren nach Anspruch 36, **gekennzeichnet durch** die Schritte, das Trageelement (112, 212, 512) und jedes der Werkzeuge (114, 214, 514) in einer komplementären halbzylindrischen Ausgestaltung zur Befestigung an einem mit Öffnungen versehenen zylindrischen Rotationsmaschinenrahmen (150, 250, 550) der Maschine auszubilden.

**41.** Verfahren nach Anspruch 36, **gekennzeichnet durch** die Schritte, ein Kennzeichen in dem Werkzeugtrageelement (12, 112, 212, 312, 412, 512) vorzusehen und die Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) in Bezug auf die Anordnung des Kennzeichens unter Verwendung einer X-Y-Koordinatenmatrix auf Basis der Kennzeichenanordnung anzuordnen.

**42.** Verfahren nach Anspruch 36, **gekennzeichnet durch** den Schritt, jede der Befestigungseinrichtungen (32, 132, 232, 332, 432, 532) in einer vorbestimmten Position zu befestigen und das Werkzeugtrageelement (12, 112, 212, 312, 412, 512) **durch** eine Verlagerung auf Basis der Anordnung des Kennzeichens zu bewegen und jede Befestigungseinrichtung (32, 132, 232, 332, 432, 532) an dem Werkzeugtrageelement (12, 112, 212, 312, 412, 512) zu befestigen, während es in der vorbestimmten Position fixiert ist.

**Revendications**

**1.** Ensemble de matrice d'arts graphiques (10, 110, 210, 310, 410, 510) adapté pour être monté comme unité sur le châssis à trous (50) d'une presse à plat ou sur le châssis cylindrique à trous (150, 250, 550) d'une presse rotative d'arts graphiques, ledit ensemble comprenant :

- une pluralité de matrices(14, 114, 214, 314, 414, 514), chacune ayant une surface d'estampage, d'emboutissage ou de découpage à l'emporte-pièce (22) et une surface de montage opposée ;
- un organe de support de matrice (12, 112, 212, 312, 412, 512) pour les matrices (14, 114, 214, 314, 414, 514), ledit organe (12, 112, 212, 312, 412, 512) ayant une surface de réception de matrice (16, 116) et une surface opposée (30) qui peut se mettre en prise avec le châssis (50) d'une presse à plat ou avec le châssis (150, 250, 550) sur le cylindre d'une presse rotative,
- la pluralité de matrices d'arts graphiques (14, 114, 214, 314, 414, 514) étant montée sur ladite surface de réception de matrice (16, 116) de l'organe de support de matrice (12, 112, 212, 312, 412, 512) dans des positions relatives prédéfinies ;
- une pluralité d'attaches de matrices debout (32, 132, 232, 332, 332, 432, 532) étant fixées

à la surface de réception de matrice (16, 116) de l'organe de support de matrice (12, 112, 212, 312, 412, 512), là où il y a au moins deux attaches (32, 132, 232, 332, 332, 432, 532) pour chaque matrice (14, 114, 214, 314, 414, 514),
- chacune des matrices (14, 114, 214, 314, 414, 514) ayant un trou de passage (28, 230) positionné pour y recevoir une attache respective (32, 132, 232, 332, 332, 432, 532) et
- un connecteur qui peut être débloqué (36, 136, 236, 336, 436, 536) sur chaque attache (32, 132, 232, 332, 332, 432, 532) qui se met en prise avec une matrice respective (14, 114, 214, 314, 414, 514) pour maintenir chaque matrice (14, 114, 214, 314, 414, 514) dans une position fixée sur l'organe de support de matrice (12, 112, 212, 312, 412, 512),

**caractérisé en ce que**
les attaches (32, 132, 232, 332, 332, 432, 532) reçues dans les trous de passage (28, 230) d'une matrice respective (14, 114, 214, 314, 414, 514) sont positionnées dans une relation prédéfinie par rapport à et à l'extérieur de la surface définissant le motif (20) de cette matrice (14, 114, 214, 314, 414, 514) et que
la surface définissant le motif (20) de chaque matrice (14, 114, 214, 314, 414, 514) est conforme à l'image du motif de l'oeuvre d'art préparée.

**2.** Ensemble selon la revendication 1, **caractérisé en ce que** chacun desdits trous (28, 230) est d'une taille plus grande que l'épaisseur de l'attache (32, 132, 232, 332, 432, 532) qui y est reçue, suffisante pour permettre le mouvement de chaque matrice (14, 114, 214, 314, 414, 514) par rapport aux attaches (32, 132, 232, 332, 432, 532) pour cette matrice (14, 114, 214, 314, 414, 514) et par rapport à l'organe de support (12, 112, 212, 312, 412, 512) lorsque les connecteurs (36, 136, 236, 336, 436, 536) d'une matrice respective (14, 114, 214, 314, 414, 514) sont débloqués de l'engrènement fixé avec la matrice (14, 114, 214, 314, 414, 514).

**3.** Ensemble selon la revendication 1, **caractérisé en ce que** chacune desdites attaches (32, 132, 232, 332, 432, 532) est un goujon fileté et chacun des connecteurs (36, 136, 236, 336, 436, 536) est fileté par rotation sur un goujon respectif.

**4.** Ensemble selon la revendication 3, **caractérisé en ce que** chacun des connecteurs (36, 136, 236, 336, 436, 536) est un écrou fileté sur un goujon respectif.

**5.** Ensemble selon la revendication 3, **caractérisé en ce que** chacune des surfaces définissant le motif (20) des matrices (14, 114, 214, 314, 414, 514) est équipée d'une cavité de relief (34, 134) alignée avec un trou de passage respectif (28, 230) dans chaque matrice (14, 114, 214, 314, 414, 514) et est dimensionnée pour recevoir un connecteur (36, 136, 236, 336, 436, 536) fileté sur un goujon correspondant.

**6.** Ensemble selon la revendication 5, **caractérisé en ce que** chacune desdites cavités (34, 134) est d'une profondeur au moins égale à l'épaisseur d'un connecteur respectif (36, 136, 236, 336, 436, 536) fileté sur un goujon correspondant.

**7.** Ensemble selon la revendication 1, **caractérisé en ce que** la pluralité de matrices (14, 114, 214, 314, 414, 514) est montée sur l'organe de support (12, 112, 212, 312, 412, 512) dans une disposition conformément aux positions d'une pluralité d'oeuvres d'art à image à motif.

**8.** Ensemble selon la revendication 1, **caractérisé en ce que** ledit organe de support (12, 112, 212, 312, 412, 512) a une arête de périmètre (18), ledit organe de support (12, 112, 212, 312, 412, 512) étant équipé d'au moins une fente verrouillée d'organe de support (42, 142, 242, 594) espacée de ladite arête (18) de l'organe de support (12, 112, 212, 312, 412, 512) pour recevoir un dispositif (44, 144, 244) qui peut être en prise avec l'organe de support (12, 112, 212, 312, 412, 512) et le châssis (50) d'une presse à plat ou le châssis (150, 250, 550) d'une presse rotative sur lequel l'organe de support (12, 112, 212, 312, 412, 512) est monté pour retenir la portion de l'organe de support (12, 112, 212, 312, 412, 512) qui entoure la fente verrouillée (42, 142, 242, 594) en contact essentiel correspondant à la zone adjacente d'un châssis respectif (50, 150, 250, 550).

**9.** Ensemble selon la revendication 8, **caractérisé en ce qu'**il est prévu une pluralité de fentes verrouillées espacées (42, 142, 242, 594) dans l'organe de support (12, 112, 212, 312, 412, 512) pour recevoir des dispositifs respectifs (44, 144, 244) et situés de telle manière que les dispositifs (44, 144, 244) maintiennent l'organe de support (12, 112, 212, 312, 412, 512) en relation étroite correspondant au châssis (50) d'une presse à plat ou au châssis cylindrique (150, 250, 550) d'une presse rotative.

**10.** Ensemble selon la revendication 1, **caractérisé en ce que** ledit organe de support (112) a une pluralité d'évidements (168), avec chaque évidement (168) qui reçoit une portion d'extrémité d'une attache respective (132).

**11.** Ensemble selon la revendication 1, **caractérisé en ce que** chacune des attaches (32, 132, 232, 332, 432, 532) est un boulon fixé à la surface de réception de matrice (16, 116) de l'organe de support (12, 112, 212, 312, 412, 512).

**12.** Ensemble selon la revendication 11, **caractérisé en ce que** chacun desdits boulons est de configuration généralement cylindrique et d'une hauteur plus importante que la largeur.

**13.** Ensemble selon la revendication 11, **caractérisé en ce que** les boulons sont situés sur la surface de réception de matrice (16, 116) de l'organe de support (12, 112, 212, 312, 412, 512) dans une relation prédéfinie selon un programme numérisé dérivé de et selon l'oeuvre d'art à motif.

**14.** Ensemble selon la revendication 1, **caractérisé en ce que** lesdits trous de passage (28, 230) dans les matrices respectives (14, 114, 214, 314, 414, 514) sont dimensionnées par rapport aux attaches (32, 132, 232, 332, 332, 432, 532) qui y sont reçues en permettant le mouvement d'une matrice respective (14, 114, 214, 314, 414, 514) par rapport à l'organe de support (12, 112, 212, 312, 412, 512) par un déplacement d'au moins environ 1,27 mm (0,050 pouce).

**15.** Ensemble selon la revendication 1, **caractérisé en ce que** ledit organe de support (12, 112, 212, 312, 412, 512) a une épaisseur d'environ 0,762 mm (0,030 pouce) à environ 2,54 mm (0,100 pouce).

**16.** Ensemble selon la revendication 1, **caractérisé en ce que** chacune desdites matrices (14, 114, 214, 314, 414, 514) a une épaisseur d'environ 3,81 mm (0,150 pouce) à environ 5,59 mm (0,220 pouce).

**17.** Ensemble selon la revendication 1, **caractérisé en ce que** l'épaisseur combinée de chaque matrice (14, 114, 214, 314, 414, 514) et de l'organe de support (12, 112, 212, 312, 412, 512) est d'environ 6,35 mm (0,250 pouce).

**18.** Ensemble selon la revendication 1, **caractérisé en ce que** l'épaisseur combinée de chaque matrice (14, 114, 214, 314, 414, 514) et de l'organe de support (12, 112, 212, 312, 412, 512) est d'environ 7 mm.

**19.** Ensemble selon la revendication 1, **caractérisé en ce que** chacune desdites matrices (14, 114, 214, 314, 414, 514) a une épaisseur d'environ 4,14 mm (0,163 pouce) à environ 5,92 mm (0,233 pouce).

**20.** Ensemble selon la revendication 1, **caractérisé en ce que** l'épaisseur combinée de chaque matrice (14, 114, 214, 314, 414, 514) et de l'organe de support (12, 112, 212, 312, 412, 512) est d'environ 6,68 mm (0,263 pouce).

**21.** Ensemble selon la revendication 1, **caractérisé en ce que** chacune des matrices (14, 114, 214, 314, 414, 514) a au moins deux ouvertures (38, 238, 338, 438, 553) qui y sont ménagées et l'organe de support (12, 112, 212, 312, 412, 512) a un orifice (40) qui y est ménagé, aligné avec chaque ouverture de matrice (38, 238, 338, 438, 553), les ouvertures (38, 238, 338, 438, 553) et orifices (40) alignés étant adaptés pour recevoir un outil d'alignement qui les traverse.

**22.** Ensemble selon la revendication 1, **caractérisé en ce que** ledit organe de support (12, 312, 412) et chacune des matrices (14, 314, 414) sont de configuration plane.

**23.** Ensemble selon la revendication 1, **caractérisé en ce que** la surface qui reçoit la matrice (16, 116) et ladite surface de montage (30) de l'organe de support (12, 112, 212, 312, 412, 512) sont parallèles sur toute la zone de surface de réception de matrice de l'organe de support (12, 112, 212, 312, 412, 512).

**24.** Ensemble selon la revendication 1, **caractérisé en ce que** ledit organe de support (112, 212, 512) et chacune des matrices (114, 214, 514) est de configuration conforme semi-cylindrique.

**25.** Ensemble selon la revendication 1, **caractérisé en ce que** ledit ensemble (10, 110, 210, 310, 410, 510) comprend :

une pluralité d'organes de plaque de support de matrice (12, 112, 212, 312, 412, 512) pour les matrices (14, 114, 214, 314, 414, 514), lesdits organes de plaque (12, 112, 212, 312, 412, 512) ayant des portions d'arête (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d), une surface de réception de matrice (16, 116) et une surface de montage opposée (30) qui peut se mettre en prise avec le châssis (50) d'une presse à plat ou avec le châssis (150, 250, 550) sur le cylindre d'une presse rotative,

au moins une matrice (14, 114, 214, 314, 414, 514) étant montée sur chacun des organes de plaque de support de matrice (12, 112, 212, 312, 412, 512) dans une disposition prédéfinie par rapport à la surface d'un organe de support de matrice correspondant (12, 112, 212, 312, 412, 512),

chacun desdits organes de plaque de support de matrice (12, 112, 212, 312, 412, 512) ayant une portion d'arête (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) qui est adjacente à la portion d'arête (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) d'au moins un autre organe de support de matrice (12, 112, 212, 312, 412, 512) lorsque les unités de matrice d'arts graphiques (10, 110, 210, 310, 410, 510) sont montées dans des dispositions relatives prédéfinies sur un châssis de presse à plat (50) ou sur le châssis

(150, 250, 550) d'une presse rotative,
lesdites portions d'arête adjacentes (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) des organes de plaque de support de matrice (12, 112, 212, 312, 412, 512) ayant chacune des encoches (270) qui y sont ménagées, chacune desdites encoches (270) étant située en étant disposée pour s'aligner sur une encoche correspondante (270) dans une portion d'arête opposée (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) d'un organe de plaque de support de matrice adjacent (12, 112, 212, 312, 412, 512),
chaque paire d'encoches opposées (270) coopérant pour définir une ouverture (272) pour recevoir de manière amovible un outil d'espacement et d'alignement combiné (274).

**26.** Ensemble selon la revendication 25, **caractérisé en ce que** lesdites encoches (270) sont de configuration généralement rectangulaire.

**27.** Ensemble selon la revendication 25, **caractérisé en ce qu'**au moins une paire d'encoches (270) est prévue dans chacune desdites portions d'arête adjacentes (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) de l'organe de plaque de support de matrice (12, 112, 212, 312, 412, 512).

**28.** Ensemble selon la revendication 25, **caractérisé en ce qu'**une patte de polarisation (288) est prévue sur une portion d'arête (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) d'un organe de plaque de support de matrice (12, 112, 212, 312, 412, 512) adjacente à la portion d'arête (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) d'un autre organe de plaque de support de matrice (12, 112, 212, 312, 412, 512) et la portion d'arête adjacente (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) dudit autre organe de plaque de support de matrice (12, 112, 212, 312, 412, 512) étant équipée d'une encoche (290) située pour recevoir la patte (288) opposée, les pattes (288) et les encoches correspondantes (290) recevant les pattes (288) étant situées dans des positions différentes sur différents organes de plaque de support de matrice (12, 112, 212, 312, 412,512).

**29.** Ensemble selon la revendication 25, **caractérisé en ce qu'**au moins un desdits organes de plaque de support de matrice (12, 112, 212, 312, 412, 512) est équipé de marques de repère (286, 286a, 286b, 286c) adaptées sur ceux-ci pour être alignées avec une marque sur le châssis (50) d'une presse à plat ou sur le châssis cylindrique (150, 250, 550) d'une presse rotative d'arts graphiques pour permettre l'orientation enregistrée de l'organe de plaque de support de matrice (12, 112, 212, 312, 412, 512) avec la marque sur le châssis (50) d'une presse à plat ou sur le châssis cylindrique (150, 250, 550) d'une presse rotative.

**30.** Ensemble selon la revendication 25, **caractérisé en ce que** lesdits organes de support de plaque (12, 112, 212, 312, 412, 512) sont équipés d'au moins une découpe (316, 416, 516) adjacente aux portions d'arête périphériques (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) de chaque matrice (14, 114, 214, 314, 414, 514) montée sur l'organe de support de plaque de matrice (12, 112, 212, 312, 412, 512), chaque découpe (316, 416, 516) étant configurée pour recevoir la tête d'un outil dans une position telle que la manipulation manuelle de l'outil déplacera la matrice (14, 114, 214, 314, 414, 514) de manière sélective par rapport à la plaque de support de matrice (12, 112, 212, 312, 412, 512).

**31.** Ensemble selon la revendication 25, **caractérisé en ce que** chaque découpe (316, 516) est une ouverture rectangulaire sous-jacente et faisant saillie à l'extérieur d'une portion d'arête périphérique proximale respective (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) de la matrice (14, 114, 214, 314, 414, 514), chaque découpe (316, 516) étant configurée pour recevoir la lame (320) d'un outil.

**32.** Ensemble selon la revendication 25, **caractérisé en ce que** chaque découpe (416) est une ouverture circulaire adjacente à et espacée d'une portion d'arête périphérique proximale respective (314a, 314b, 314c, 314d, 414a, 414b, 414c, 414d) de la matrice (14, 114, 214, 314, 414, 514), chaque ouverture découpée (416) étant située et configurée pour recevoir un outil à came (418) pour déplacer de manière sélective la matrice proximale (14, 114, 214, 314, 414, 514) en réponse à la rotation de l'outil à came (418).

**33.** Ensemble selon la revendication 25, **caractérisé en ce que** ledit ensemble (10, 110, 210, 310, 410, 510) est adapté pour être monté sur un châssis cylindrique (150, 250, 550) de presse rotative ayant des rangées alternées de forures lisses (548) et d'ouvertures filetées (552), dans lequel chacun desdits organes de plaques de support de matrice (12, 112, 212, 312, 412, 512) est équipé d'ouvertures (538) qui y sont ménagées en étant disposées pour être alignées avec les ouvertures de forures lisses (548) dans le châssis cylindrique (150, 250, 550) pour la réception amovible de goujons d'alignement (590), chacun desdits organes de support de plaque de matrice (12, 112, 212, 312, 412, 512) étant de plus équipé d'ouvertures (596) qui y sont ménagées qui reçoivent des attaches qui peuvent être filetées dans les ouvertures filetées (552) dans le châssis cylindrique (150, 250, 550) pour l'attache amovible de l'organe de support de plaque de matrice (12, 112, 212, 312, 412, 512) au châssis cylindrique (150, 250, 550).

**34.** Ensemble selon la revendication 33, **caractérisé en ce que** lesdites ouvertures (538) et les ouvertures (596) dans chacun des organes de support de plaque de matrice (12, 112, 212, 312, 412, 512) sont situées en étant disposées selon une matrice de coordonnées X-Y qui correspond à la matrice de coordonnées X-Y des ouvertures (548, 552) dans le châssis cylindrique (150, 250, 550) sur lequel les organes de support de plaque de matrice (12, 112, 212, 312, 412, 512) sont montés.

**35.** Ensemble selon la revendication 33, **caractérisé en ce que** chacun desdits organes de support de plaque de matrice (12, 112, 212, 312, 412, 512) est équipé de fentes (594) et d'une série d'attaches, lesdites fentes (594) étant situées pour permettre la fixation des organes de support de plaque de matrice (12, 112, 212, 312, 412, 512) au châssis cylindrique (150, 250, 550) dans lequel toutes les ouvertures dans le châssis (150, 250, 550) sont forées lisses, certaines desdites attaches étant adaptées pour s'étendre à travers les fentes (594) dans les ouvertures de châssis alignées respectives et d'autres attaches se mettant en prise avec la périphérie de chaque organe de support de matrice (12, 112, 212, 312, 412, 512) et étant adaptées pour s'étendre dans les ouvertures alignées de châssis.

**36.** Procédé de préparation d'un ensemble de matrice d'arts graphiques (10, 110, 210, 310, 410, 510) adapté pour être monté comme unité sur le châssis à trous (50) d'une presse à plat ou sur le châssis cylindrique à trous (150, 250, 550) d'une presse rotative d'arts graphiques, ledit procédé comportant les étapes de :

formation d'une surface de commande d'estampage, d'emboutissage ou de découpage de matrice (22) dans chacune des matrices d'une pluralité de matrices (14, 114, 214, 314, 414, 514), chacune desdites surfaces de commande (22) étant adaptée aux oeuvres d'art à motif ;
formation d'au moins deux trous de passage (28, 230) dans chaque matrice (14, 114, 214, 314, 414, 514) situés à l'extérieur de et dans une disposition prédéfinie par rapport à la surface de commande (22) d'une matrice respective (14, 114, 214, 314, 414, 514) ;
fourniture d'un organe de support de matrice (12, 112, 212, 312, 412, 512) pour les matrices (14, 114, 214, 314, 414, 514) dans lequel l'organe de support (12, 112, 212, 312, 412, 512) a une surface de réception de matrice (16, 116) et une surface de montage opposée (30) qui peut se mettre en prise avec un châssis d'une presse à plat (50) ou un châssis cylindrique rotatif (150, 250, 550) ;
attache d'une pluralité d'attaches (32, 132, 232, 332, 332, 432, 532) à l'organe de support de matrice (12, 112, 212, 312, 412, 512) et chacune étant située par rapport à l'autre en étant disposée pour être reçue dans un trou de passage respectif (28, 230) d'une matrice correspondante (14, 114, 214, 314, 414, 514) ;
positionnement des matrices (14, 114, 214, 314, 414, 514) sur la plaque de support (12, 112, 212, 312, 412, 512) avec des attaches (32, 132, 232, 332, 332, 432, 532) reçues dans des trous respectifs (28, 230) dans une matrice correspondante (14, 114, 214, 314, 414, 514) et
application d'un connecteur (36, 136, 236, 336, 436, 536) à chacune des attaches (32, 132, 232, 332, 332, 432, 532) disposés de manière à se mettre en prise de manière amovible avec une matrice respective (14, 114, 214, 314, 414, 514) pour attacher de manière fixe chaque matrice (14, 114, 214, 314, 414, 514) à l'organe de support (12, 112, 212, 312, 412, 512), **caractérisé par** les étapes de numérisation de l'oeuvre d'art à motif, de formation d'une surface de commande (22) sur chaque matrice (14, 114, 214, 314, 414, 514) selon l'oeuvre d'art numérisée et de localiser les trous de passage (28, 230) dans chaque matrice (14, 114, 214, 314, 414, 514) et de positionner les attaches (32, 132, 232, 332, 332, 432, 532) sur l'organe de support (12, 112, 212, 312, 412, 512) pour s'adapter à l'oeuvre d'art numérisée.

**37.** Procédé selon la revendication 36, **caractérisé par** l'étape de fixation successive des attaches (32, 132, 232, 332, 332, 432, 532) sur la surface de support de matrice (16, 116) de l'organe de support (12, 112, 212, 312, 412, 512).

**38.** Procédé selon la revendication 36, **caractérisé par** les étapes de formation d'au moins une fente verrouillée d'organe de support (42, 142, 242, 594) dans l'organe de support de matrice (12, 112, 212, 312, 412, 512) disposée de manière espacée par rapport à l'arête périphérique (18) de l'organe de support (12, 112, 212, 312, 412, 512).

**39.** Procédé selon la revendication 36, **caractérisé par** les étapes de formation de trous de passage (28, 230) dans l'organe de support (12, 112, 212, 312, 412, 512) plus grands que la largeur des attaches respectives (32, 132, 232, 332, 332, 432, 532) et de déblocage temporaire des connecteurs (36, 136, 236, 336, 436, 536) de l'engrènement fixé avec l'organe de support (12, 112, 212, 312, 412, 512) d'une ampleur pour permettre le déplacement d'une matrice respective (14, 114, 214, 314, 414, 514) par rapport aux attaches (32, 132, 232, 332, 332, 432, 532) reçues dans les trous de passage (28, 230) à travers cette matrice (14, 114, 214, 314, 414, 514).

**40.** Procédé selon la revendication 36, **caractérisé par** les étapes de formation de l'organe de support (12, 212, 512) et chacune des matrices (114, 214, 514) étant de configuration semi-cylindrique complémentaire pour le montage sur un châssis cylindrique à trous (150, 250, 550) de presse rotative de la presse.

**41.** Procédé selon la revendication 36, **caractérisé par** les étapes de fourniture d'un marquage dans l'organe de support de matrice (12, 112, 212, 312, 412, 512) et de localisation des attaches par rapport à la position du marquage utilisant une matrice de coordonnées X-Y basée sur la position du marquage.

**42.** Procédé selon la revendication 36, **caractérisé par** l'étape de fixation de chacune des attaches (32, 132, 232, 332, 332, 432, 532) dans une position prédéfinie et de déplacement de l'organe de support de matrice (12, 112, 212, 312, 412, 512) par un déplacement basé sur la position du marquage et de blocage de chaque attache (32, 132, 232, 332, 332, 432, 532) à l'organe de support de matrice (12, 112, 212, 312, 412, 512) pendant qu'elle est fixée dans ladite position prédéfinie.

FIG. 1.

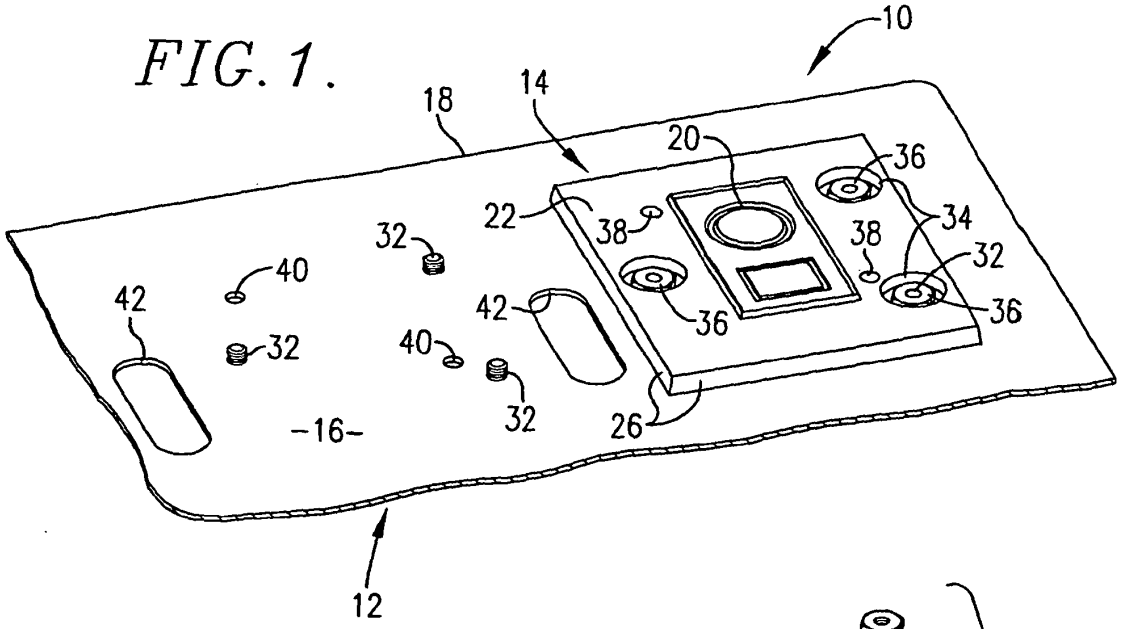



FIG. 2.

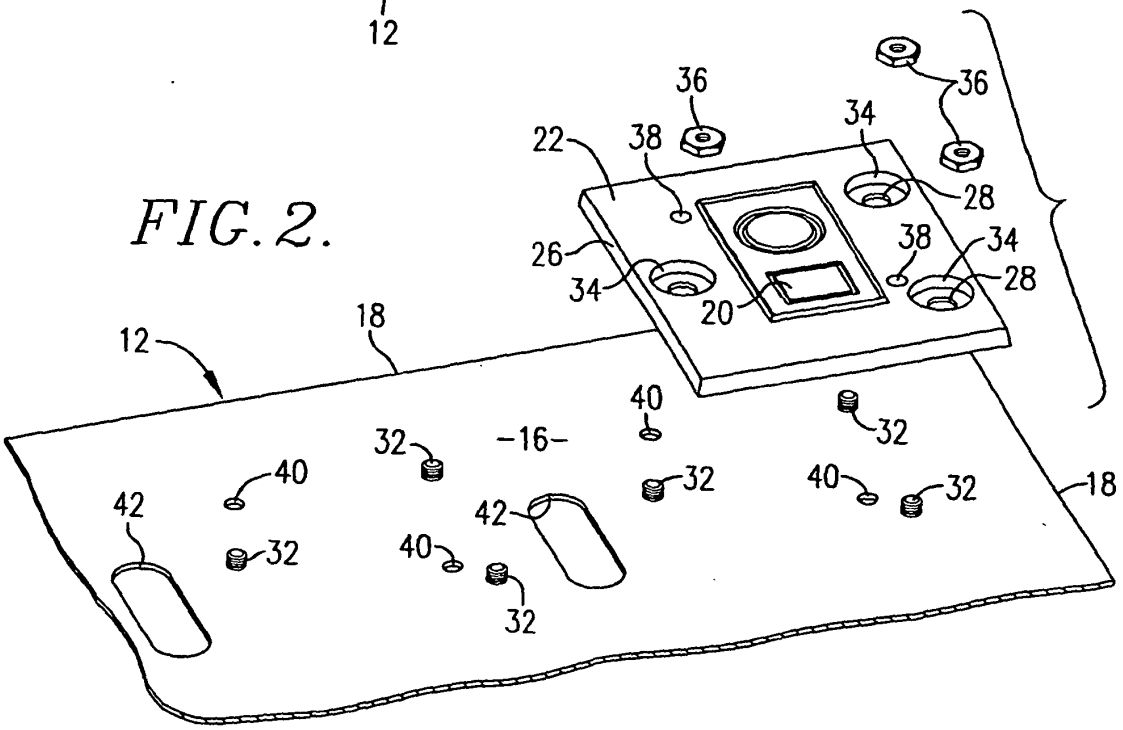
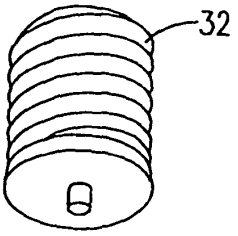



FIG. 5.



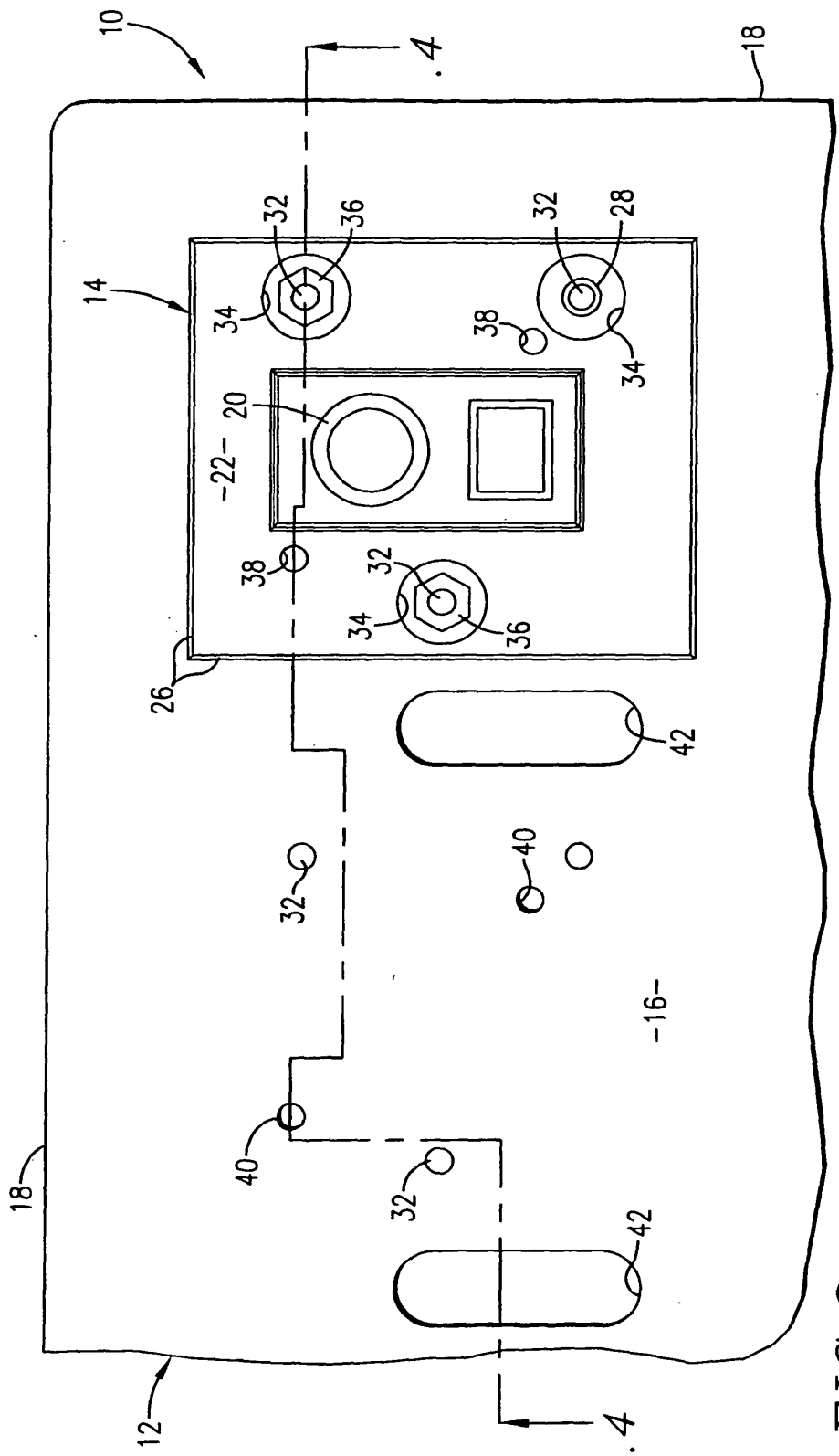

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FIG. 3.

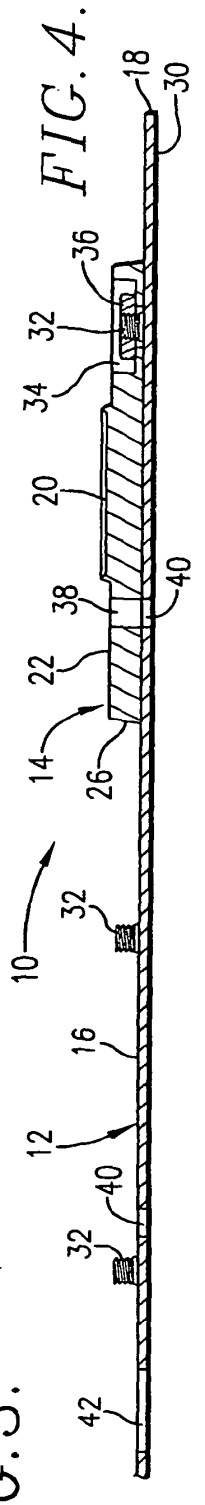
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FIG. 4.

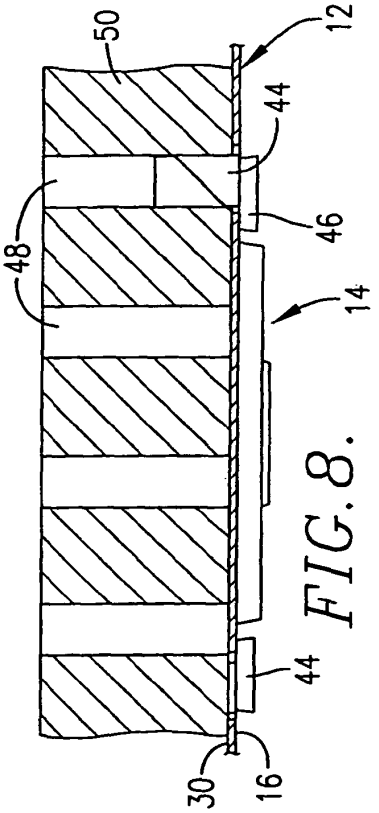



FIG. 8.

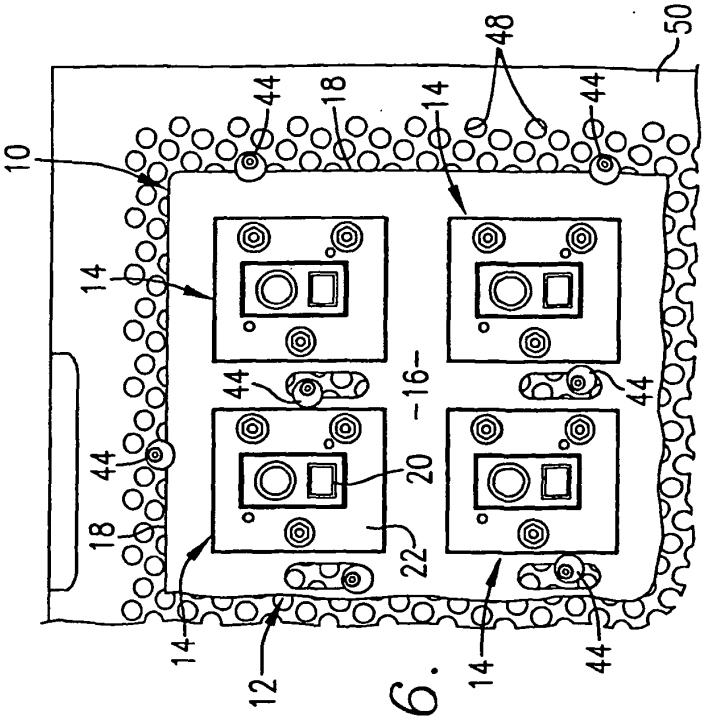
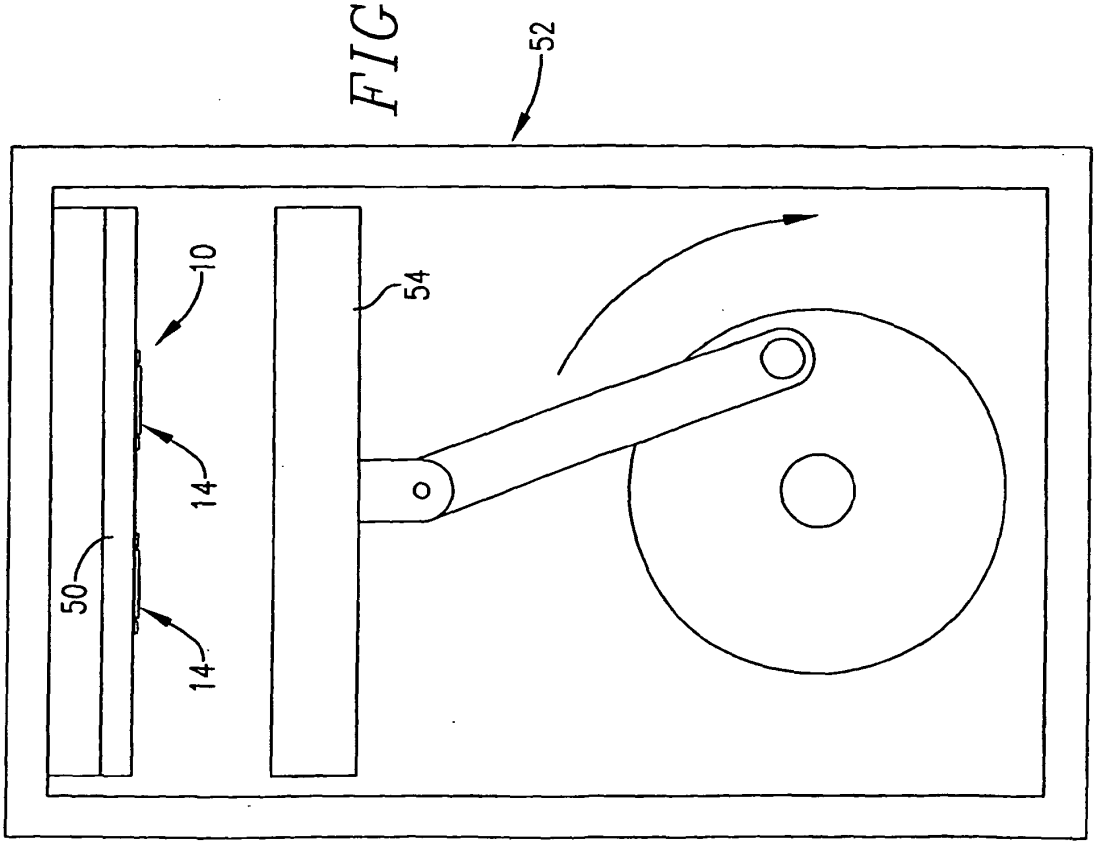



FIG. 6.

FIG. 7.



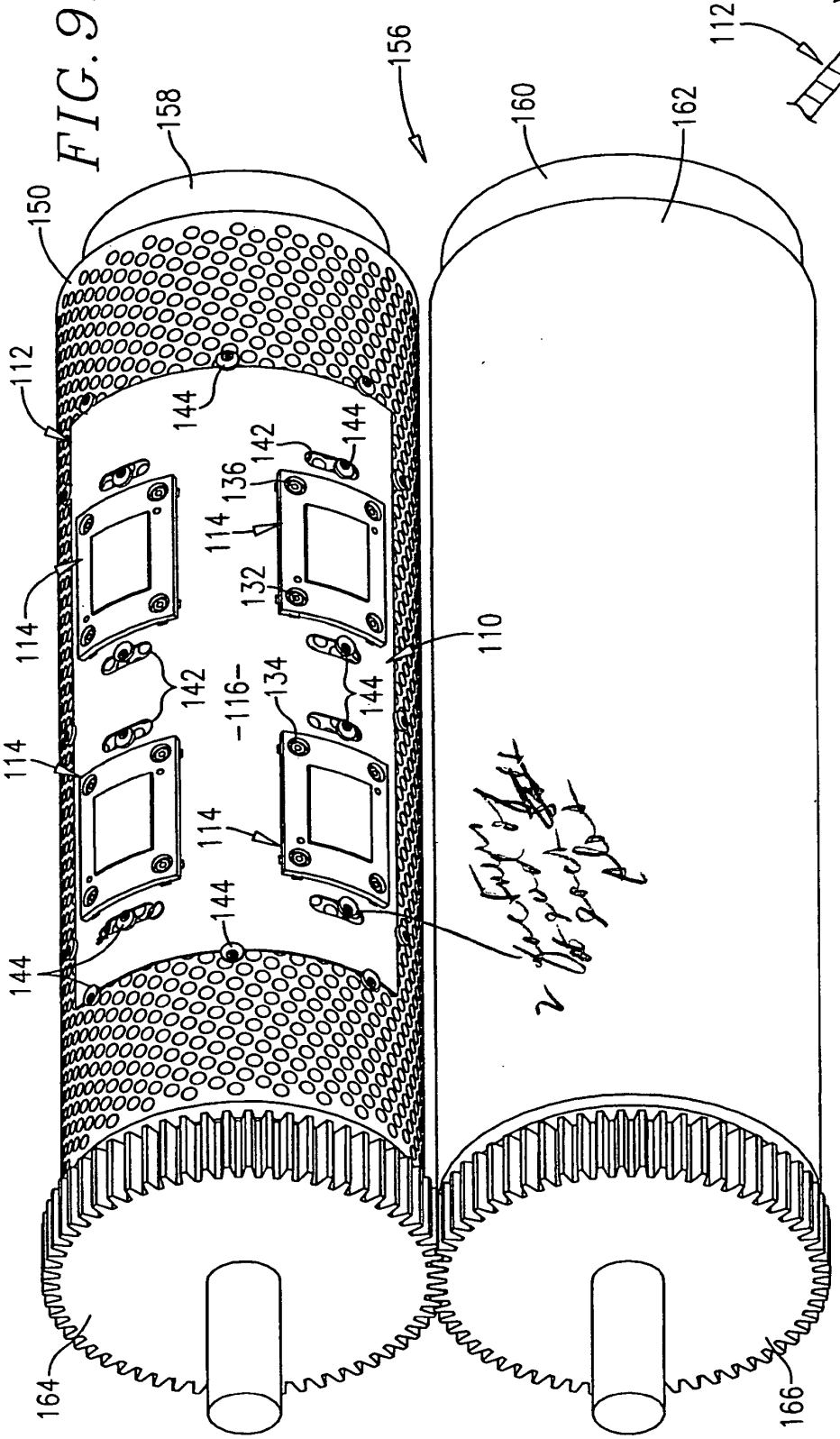

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FIG. 9.

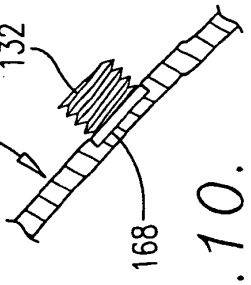
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FIG. 10.

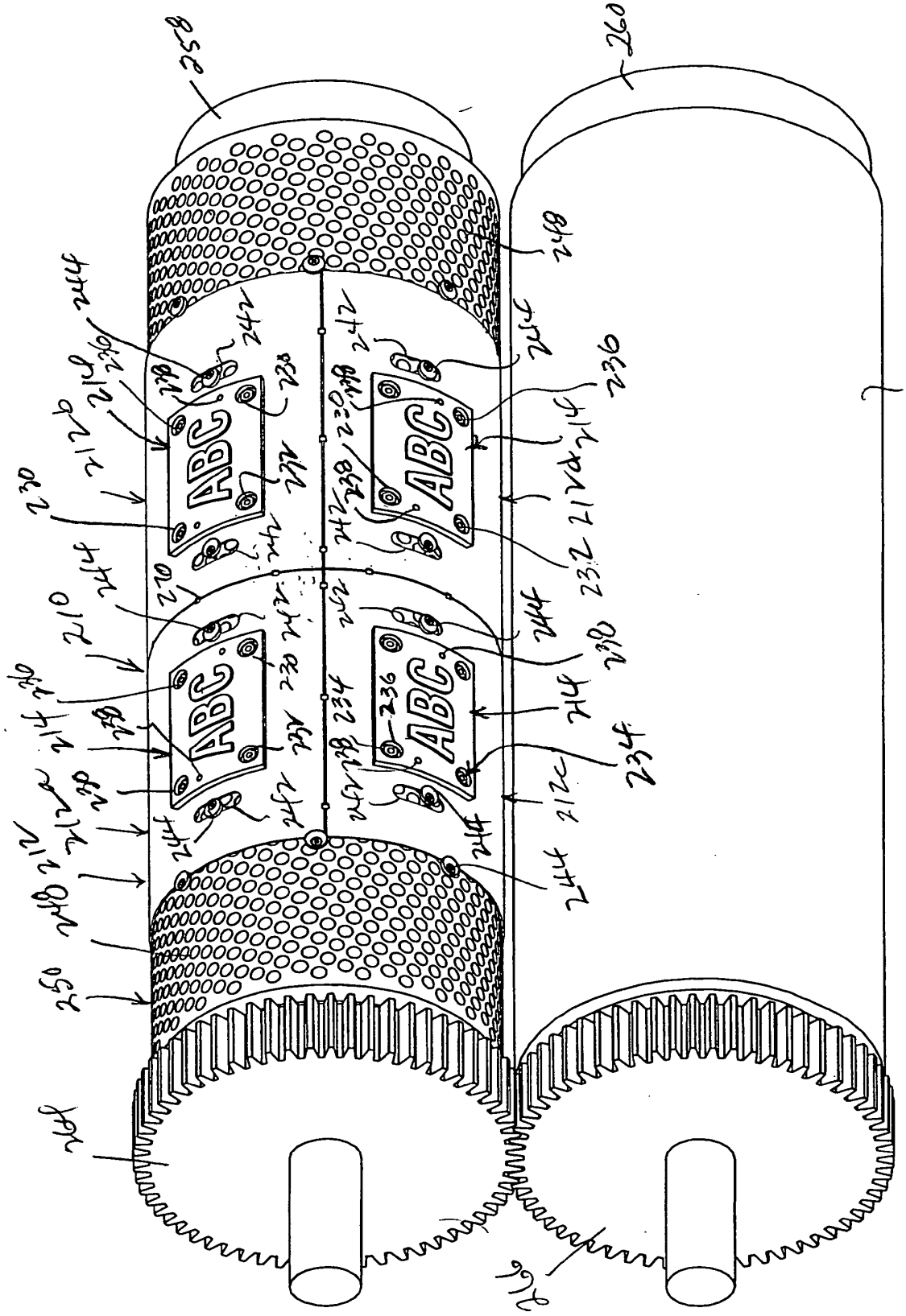


FIG. 11.

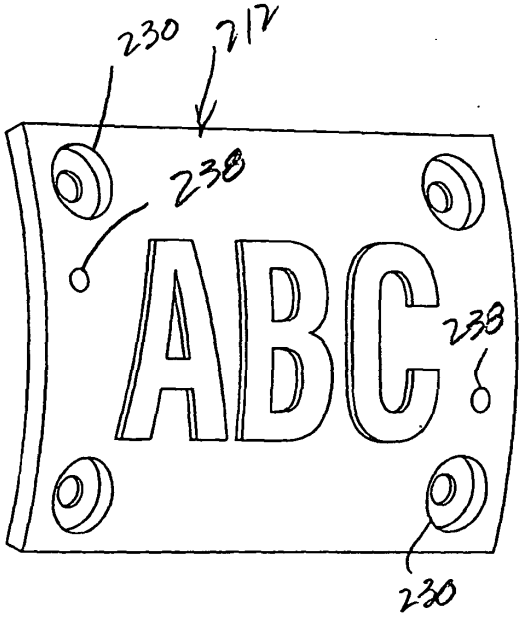


FIG. 12.

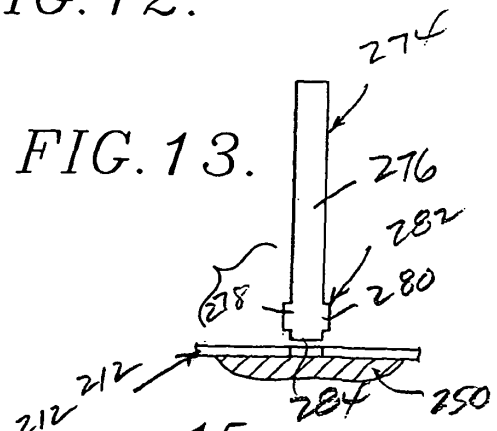


FIG. 13.

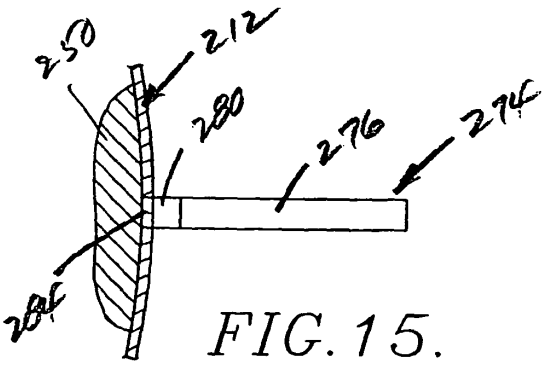


FIG. 15.

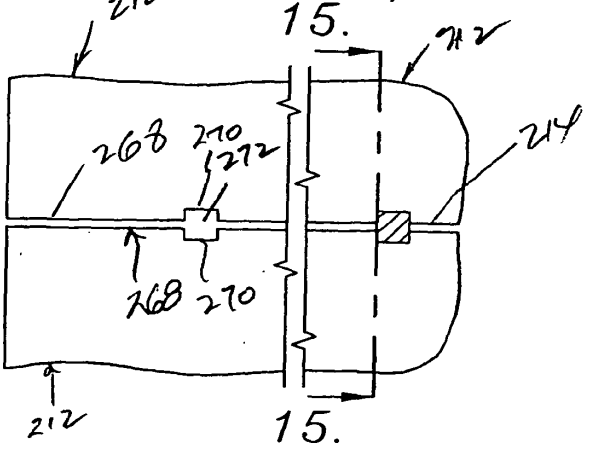


FIG. 14.

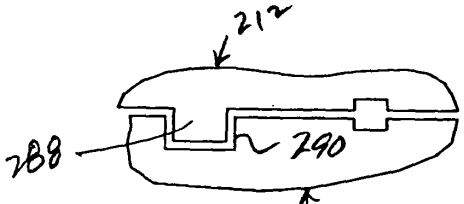


FIG. 17.

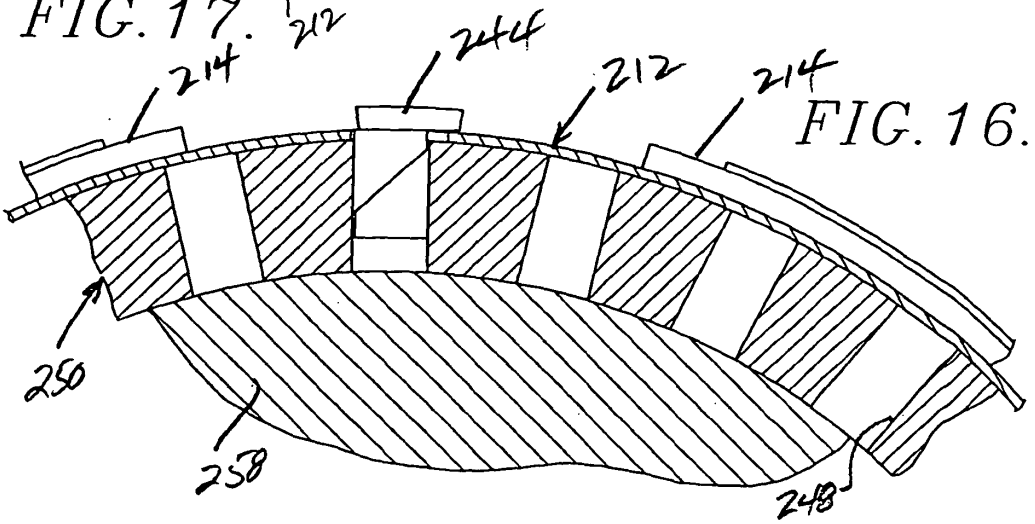


FIG. 16.

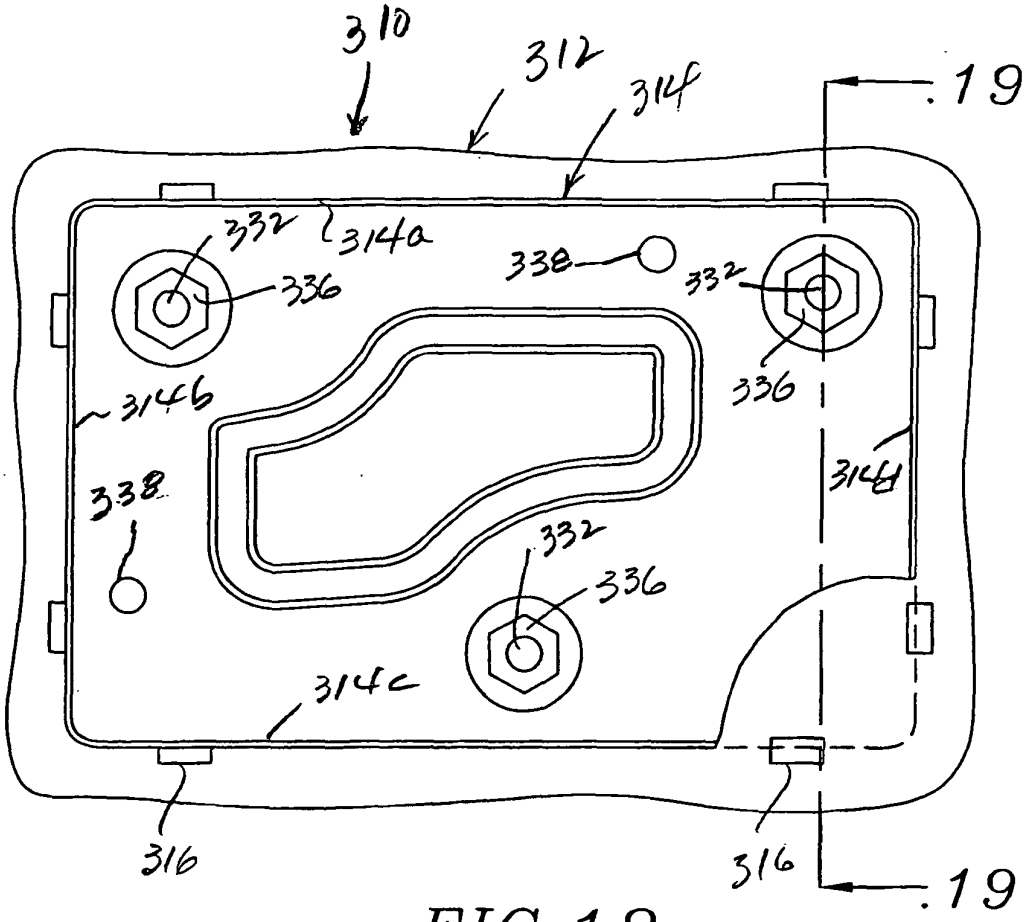
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FIG. 18.

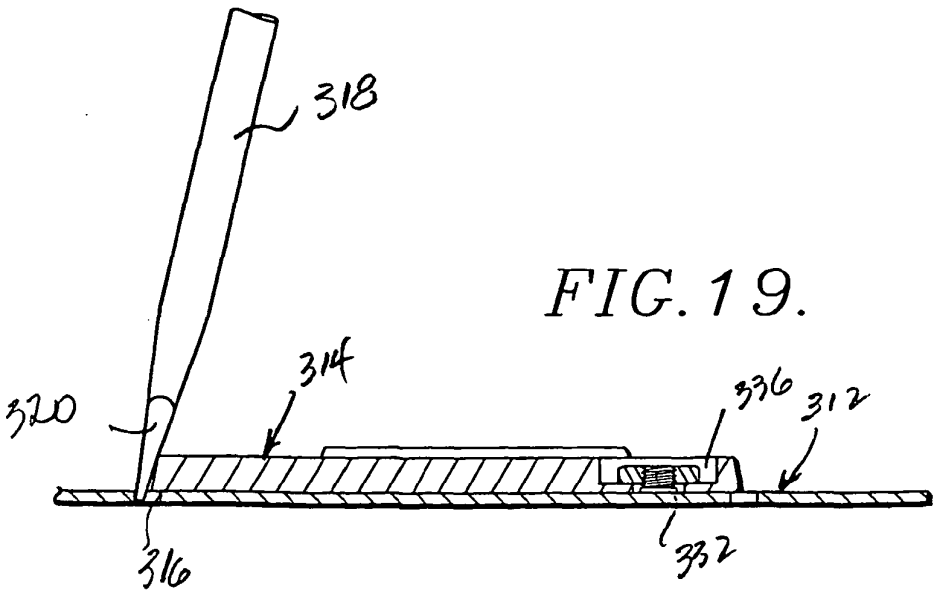
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FIG. 19.

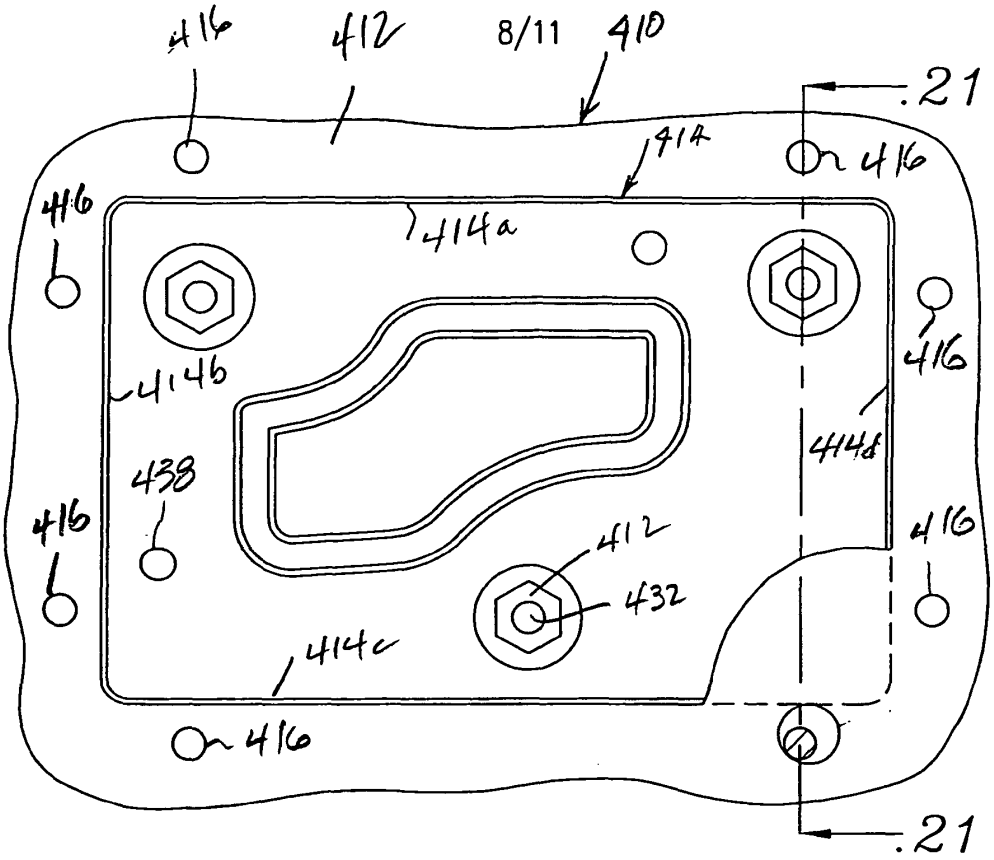



FIG. 20.

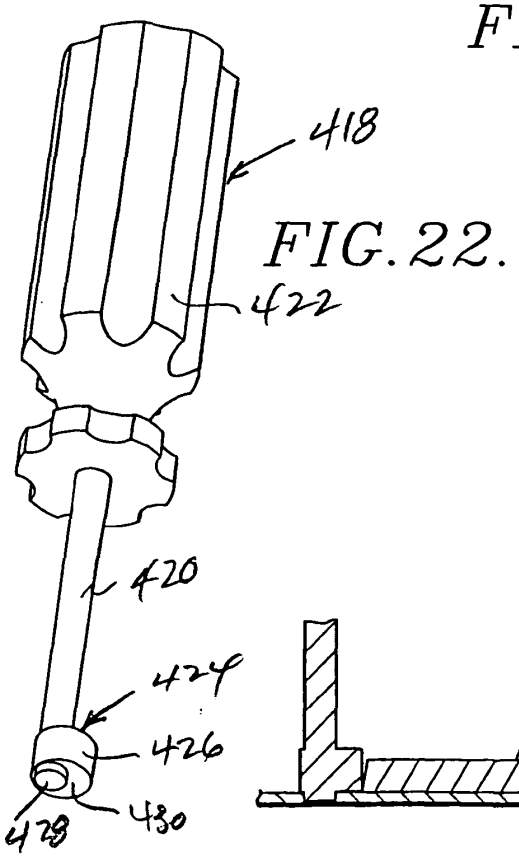



FIG. 22.

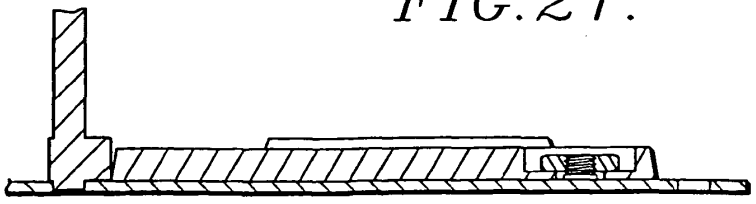
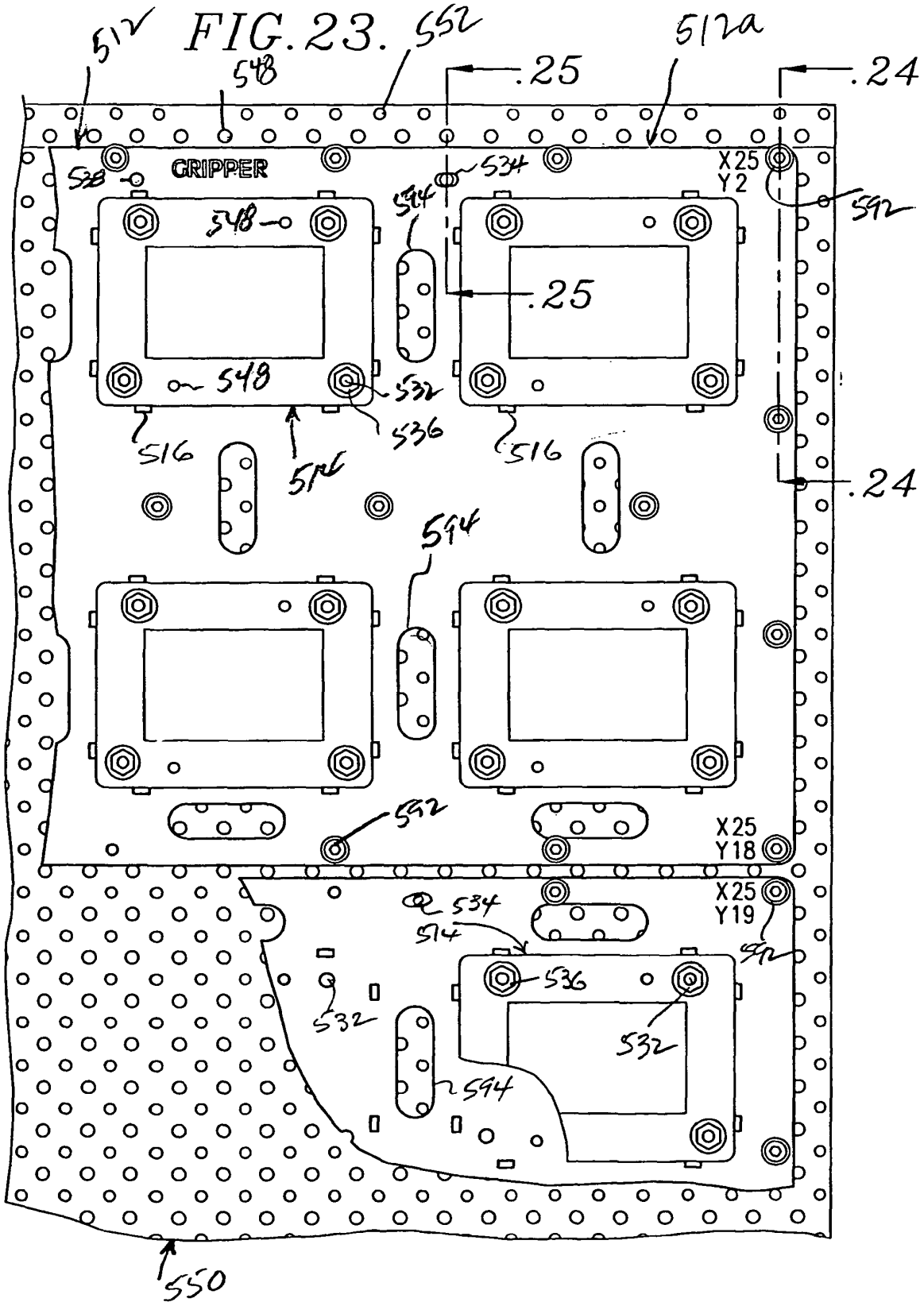


FIG. 21.

FIG. 23.


512
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552
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512a
.24
GRIPPER
534
X25
Y2
592
548
514
.25
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536
516
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.24
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X25
Y18
534
514
X25
Y19
592
536
532
532
594
550

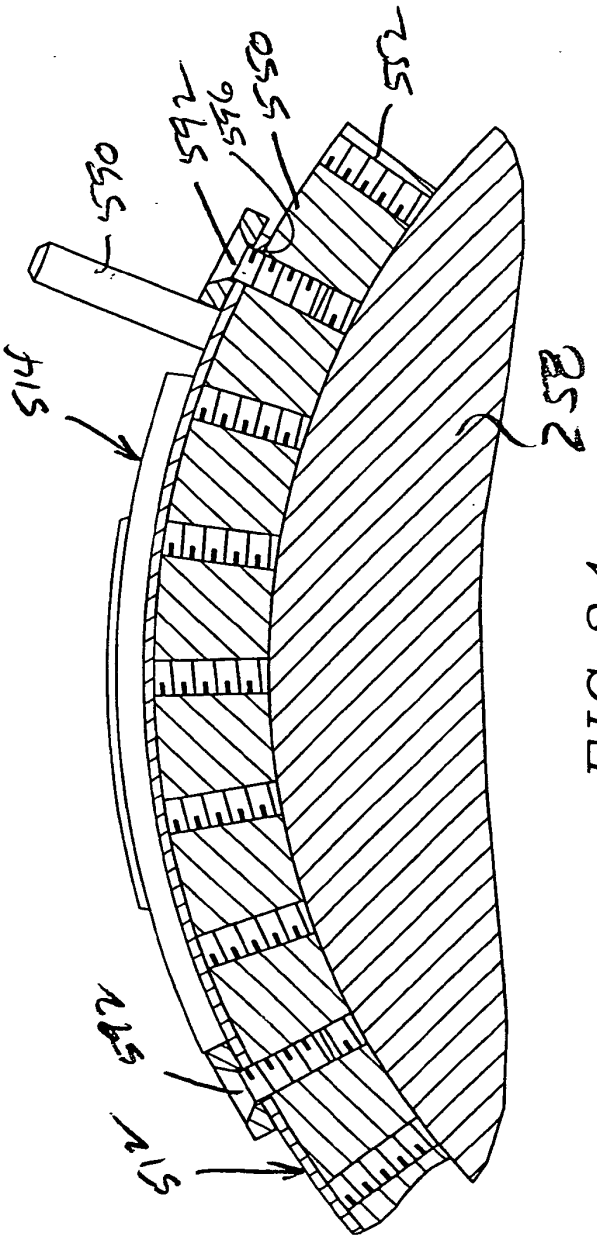
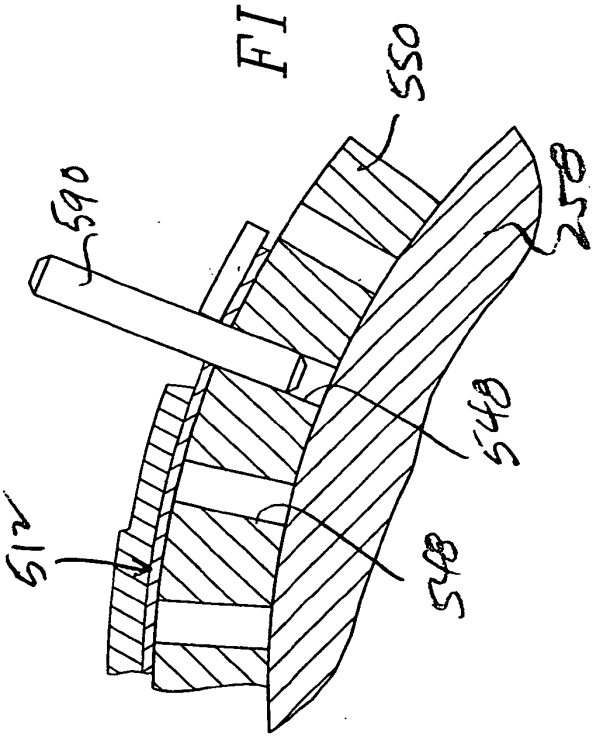



FIG. 24.

FIG. 25.



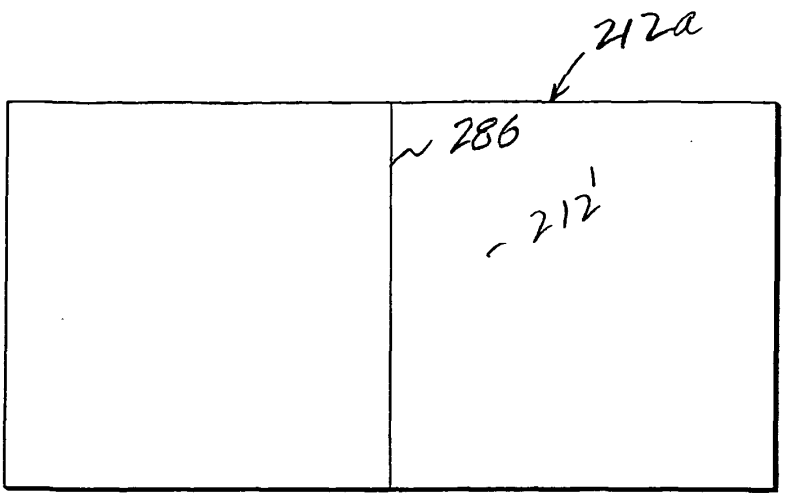



FIG. 26.

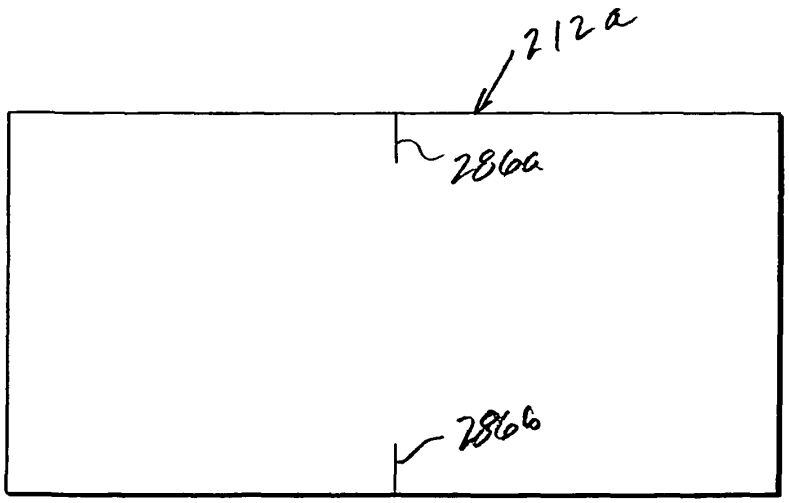



FIG. 27.

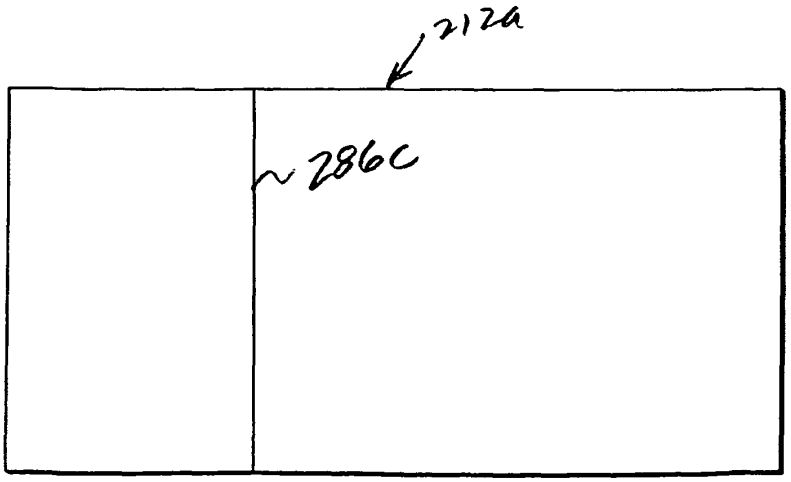



FIG. 28.

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- US 6658978 B **[0011]**
- EP 1457297 A **[0012]**