July 21, 1959 S. HEFLER ET AL 2,895,533

PRINTING PLATE ASSEMBLY FORMER

Filed Aug. 14, 1956 6 Sheets-Sheet 1

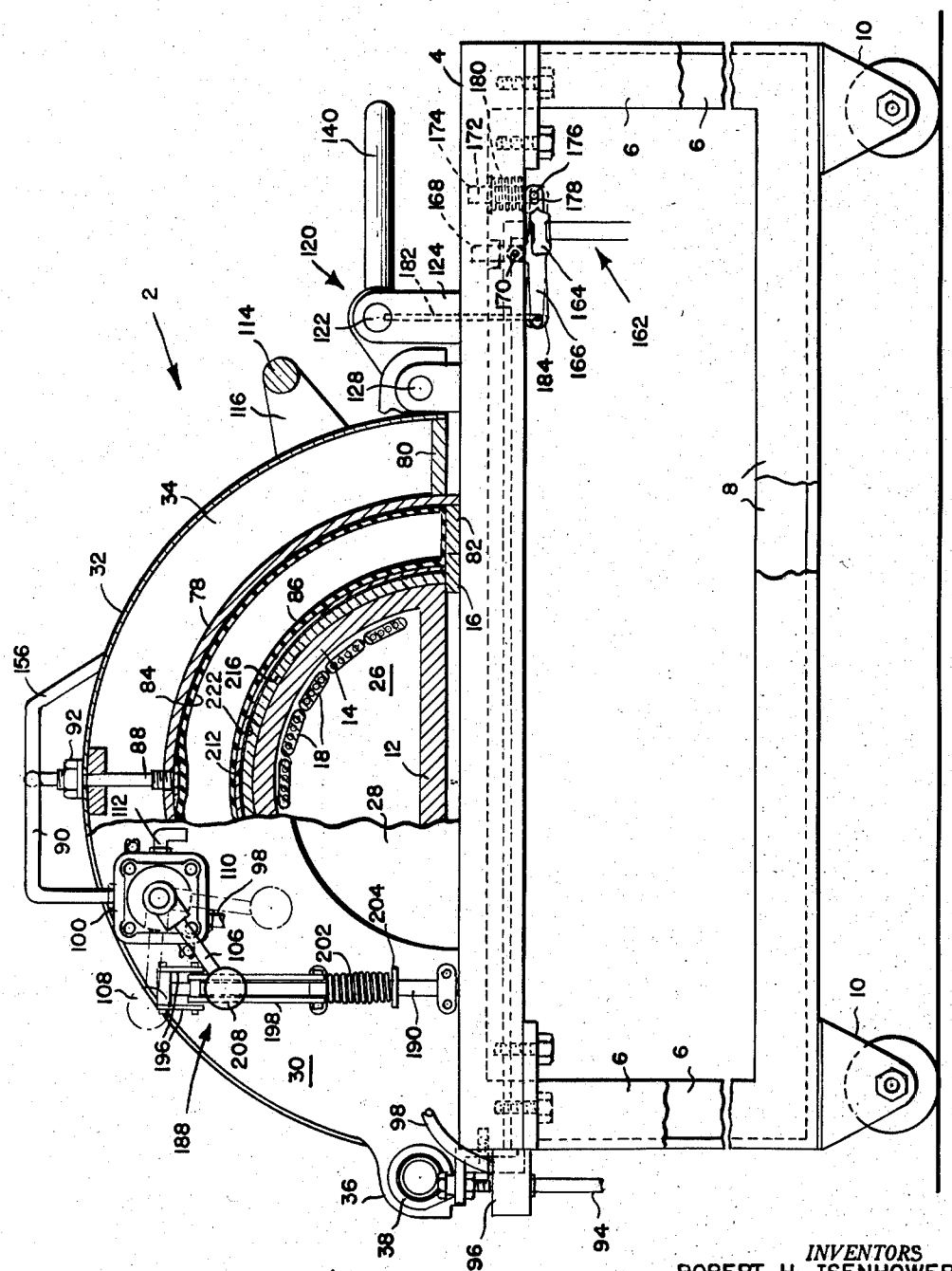


FIG. 1.

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PRINTING PLATE ASSEMBLY FORMER

Filed Aug. 14, 1956 6 Sheets-Sheet 2

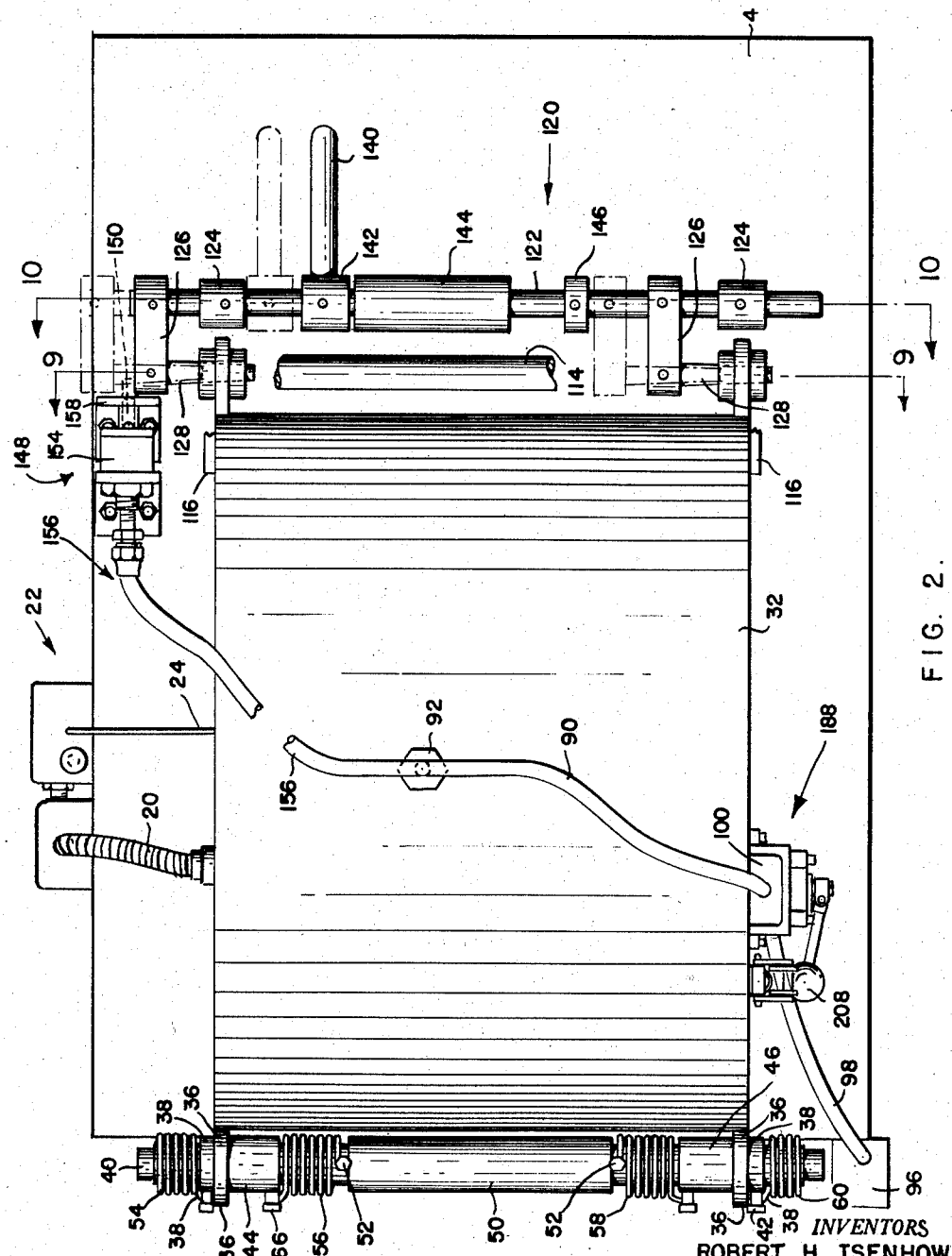


FIG. 2.

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PRINTING PLATE ASSEMBLY FORMER

Filed Aug. 14, 1956 6 Sheets-Sheet 3

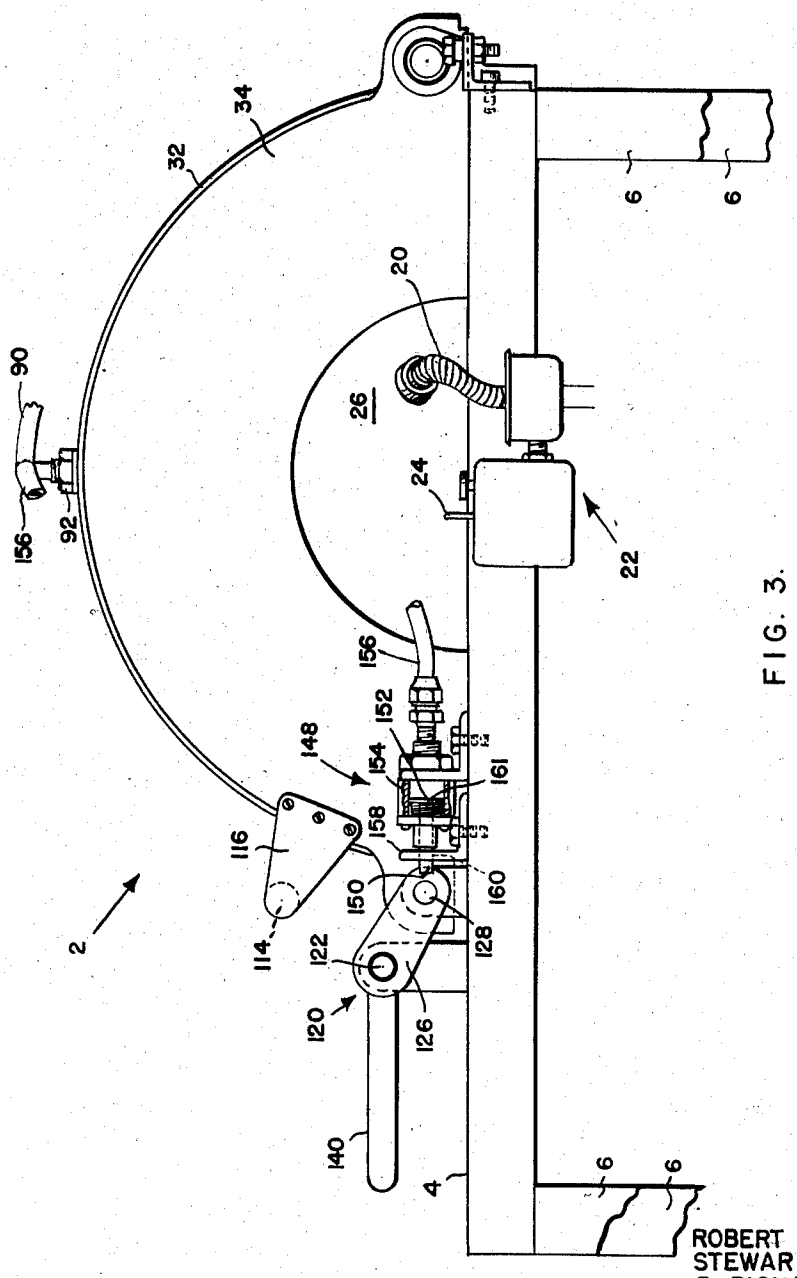


FIG. 3.

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PRINTING PLATE ASSEMBLY FORMER

Filed Aug. 14, 1956 6 Sheets-Sheet 4

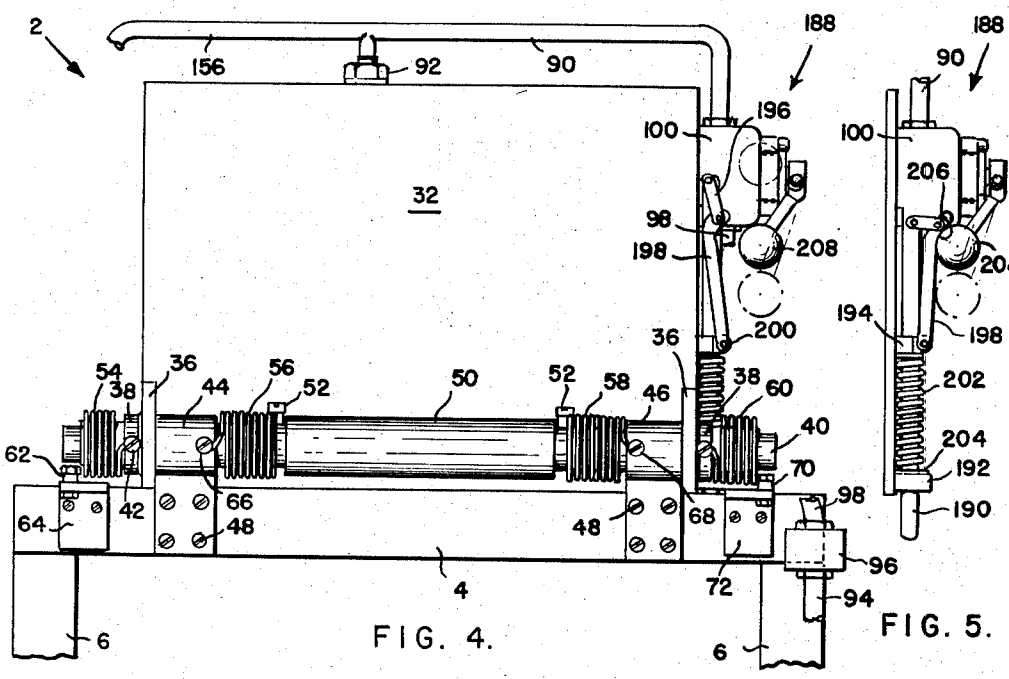


FIG. 4.

FIG. 5.

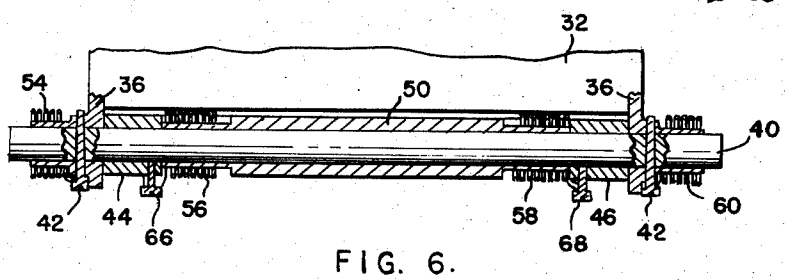


FIG. 6.

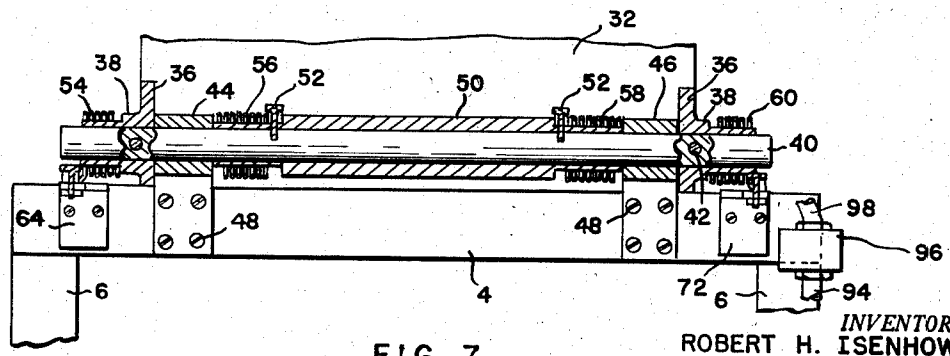


FIG. 7.

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PRINTING PLATE ASSEMBLY FORMER

Filed Aug. 14, 1956 6 Sheets-Sheet 5

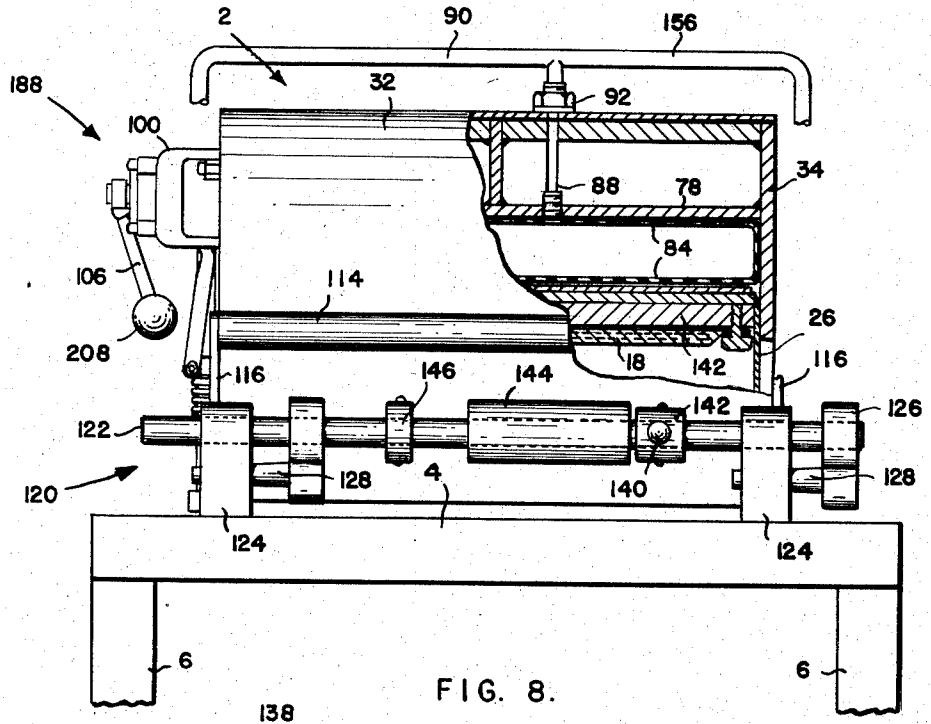


FIG. 8.

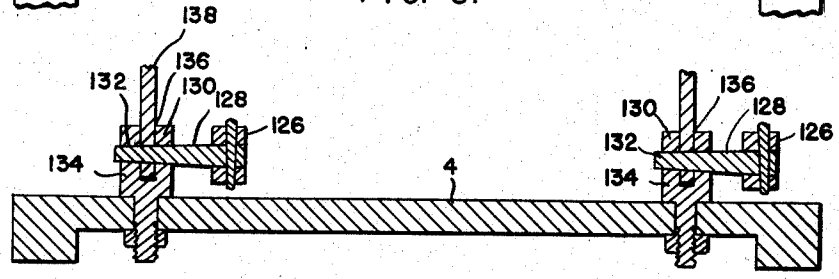


FIG. 9.

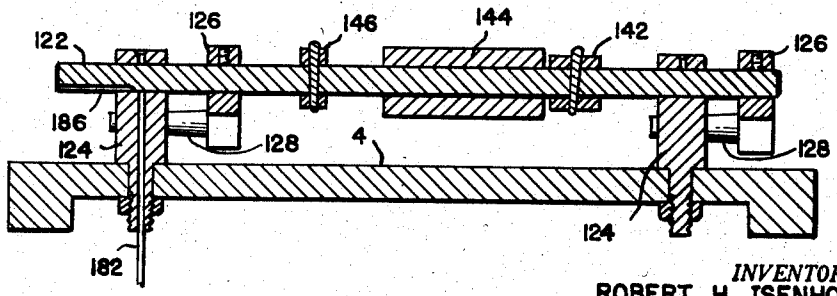


FIG. 10.

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PRINTING PLATE ASSEMBLY FORMER

Filed Aug. 14, 1956 6 Sheets-Sheet 6

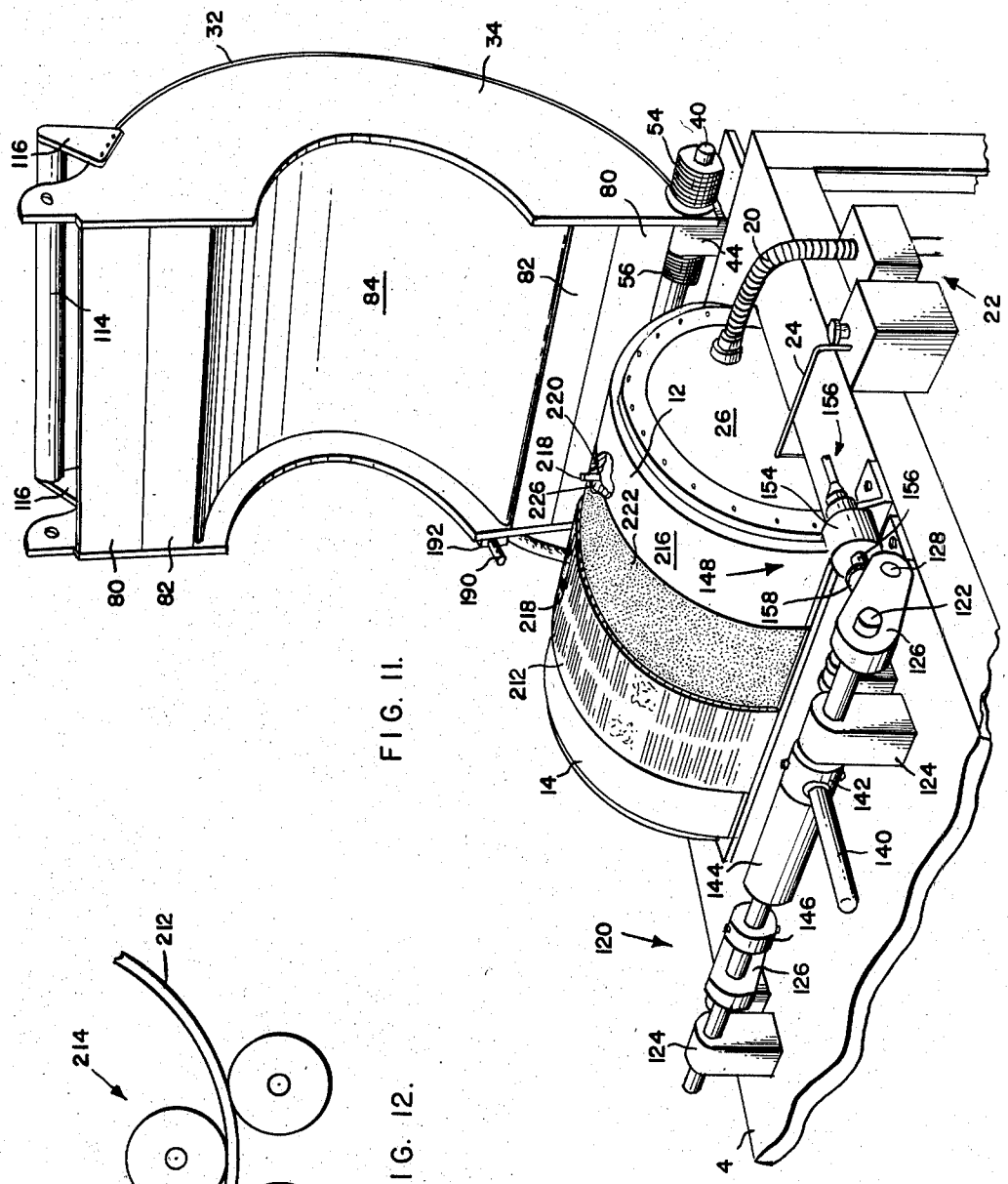


FIG. 11.

FIG. 12.

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United States Patent Office 2,895,533 Patented July 21, 1959

2,895,533

PRINTING PLATE ASSEMBLY FORMER

Steward Hefler, Robert H. Isenhower, and Richard B. Singer, Ocala, Fla., assignors to Perry Printing Process Company, Ocala, Fla., a corporation of Florida

Application August 14, 1956, Serial No. 603,966

6 Claims. (Cl. 154—1)

This invention relates to a printing plate assembly former.

The printing plate assembly former, in accordance with this invention, has particular utility for forming an assembly of a thin photoengraved metal printing plate, for example, a photoengraved magnesium plate of a thickness of from about .025" to .625", and a heavy metal base plate. Such an assembly is suitable for locking onto the plate cylinder of a high speed, rotary web perfecting press using the conventional lock-up mechanisms on such a press.

The plate assembly former in accordance with this invention provides means for heating a thermosetting adhesive positioned between the printing plate and the base plate in order to adhere them together. It accurately conforms the printing plate to the arc of the semicylindrical backing plate and provides perfect contact of the back of the printing plate and the supporting surface of the base plate with the adhesive. This is of great importance since a uniform heating of the adhesive throughout and good contact with the surfaces to be bonded is essential.

The means for bonding the printing plate to the base plate must meet the requirement of maintaining a minimum differential between the level of the printing image and the depth of the non-printing area. If this differential is insufficient, the inking roller will deposit ink in the non-printing area resulting in a defacement of the sheet being printed and further the sheet being printed will be "smutted" by picking up ink in the non-printing area which accumulates from flying ink spray. Particularly where this differential on the flat, photoengraved thin plate, of necessity, is close to the minimum, as is the case with most photoengraving processes due to the limit to the depth of etch which can be obtained without detriment to the printing area of the plate, it is highly desirable that the printing plate must be accurately curved to the base plate and uniformly tightly bonded to the base plate in order to retain the full depth of etched obtained on the flat printing plate. The apparatus in accordance with this invention achieves a very satisfactory result along these lines and eliminates the need for further powdering and re-etching and time consuming mechanical routing of the printing plates. The elimination of mechanical routing of the curved printing plate after it is mounted on the base plate is not only highly advantageous in saving an extra operation but is further important in that such routing frequently results in routing through the engraving and badly damaging the base plate.

The apparatus in accordance with this invention is easy to construct, efficient in its operation and is provided with mechanisms to preclude accidental damage to the apparatus or operating personnel.

The above discussed objects of this invention and other objects of the invention will become apparent on reading the description in conjunction with the following drawings in which:

Figure 1 is a side elevation of a plate assembly former in accordance with the invention showing the left side partially broken away;

Figure 2 is a plan view of the plate assembly former of Figure 1;

Figure 3 is a side elevation of the plate assembly former of Figure 1 showing the right-hand side partially broken away with fluid under pressure being supplied to line **90**;

Figure 4 is a rear elevation of the plate assembly former of Figure 1 partially broken away;

Figure 5 is a rear elevation of the mechanical safety lock for the operating valve shown in Figure 4;

Figure 6 is a horizontal section through the hinging apparatus shown in Figure 4;

Figure 7 is a vertical section through the hinging apparatus shown in Figure 4;

Figure 8 is a front elevation of the plate assembly former of Figure 1 partially broken away;

Figure 9 is a vertical section taken on the plane indicated by the line **9—9** in Figure 2 and showing a portion of the cover locking mechanism;

Figure 10 is a section taken on the plane indicated by the line **10—10** in Figure 2 and showing a portion of the cover locking mechanism.

Figure 11 is a front perspective view, partially broken away, of the plate assembly former of Figure 1 with the cover raised.

Figure 12 is a schematic view of a three roll bender bending a printing plate.

As shown in the figures and referring particularly to Figure 1, a plate assembly former **2**, in accordance with this invention, has a base **4** mounted on leg members **6** which are tied together by longitudinal stringers **8**. Legs **6** are mounted on casters **10** to provide mobility to the structure.

As best seen in Figure 1, a heavy metal base plate support **12** having a hemicylindrical supporting face **14** is supported on a pair of metal bars **16**, **16** which, in turn, are secured to base **4**. Adjacent the interior surface of face **14**, there is provided a series of heating elements **18** which are adapted to apply heat to an adhesive between a base plate and a printing plate. As shown in Figure 3, the heating elements **18** are supplied current through a shielded circuit indicated at **20**. The amount of heating can be controlled by means of a thermostatic control unit indicated generally at **22** and having a sensing element **24** which extends into member **12**. The support **12** is provided with side walls **26** and **28**.

Plate assembly former **2** is provided with a cover **30** which cooperates with support **12**. Cover **30** has a substantially semicylindrical top plate **32** and side plates **34**, **34**.

As best seen in Figures 2 and 5 through 7, cover **30** is mounted so that it can be opened and closed by pivoting at its rear end. Extension portions **36**, **36** have hubs **38**, **38**, respectively. Hubs **38**, **38** are secured to a shaft **40** by means of screws **42**, **42**. Shaft **40** is mounted for rotation on bearings **44** and **46** which, in turn, are secured to base **4** by screws **48**. A spacer **50** is mounted on shaft **40** between bearings **44** and **46** and is fixably secured to shaft **40** by means of screws **52**. A series of torsion springs **54**, **56**, **58** and **60** are employed to counterbalance cover **30** in order to facilitate the raising of the cover. Torsion spring **54** has one end secured to a bolt **62** secured to bracket **64** and the other end secured to the adjacent screw **42**. Torsion spring **56** has one end secured to screw **66** and the other end secured to the adjacent screw **52**. Similarly, spring **58** has one end secured to the adjacent screw **52** and screw **68**. Spring **60** has one end secured to a bolt **70** attached to bracket **72** and the other end secured to the adjacent screw **42**.

Again referring to Figure 1, a hemicylindrical backing

plate 78 is mounted inside cover 30. Backing plate 78 is secured to sides 34, 34 and to transverse plates 80, 80 by, for example, welding. Transverse plates 82 are secured, for example, by welding, to the interior surface of backing plate 78 at its lower edges. A rubber bag 84 is secured against backing plate 78 and to plates 82 by an adhesive with side 86 forming, in effect, a semi-cylindrical expandible diaphragm. Bag 84 is provided with a stem 88 which passes through backing plate 78 and top plate 32 being connected to air supply line 90 at 92.

Fluid, preferably air, at the desired pressure, is supplied to pipe 90 through supply hose 94, solenoid valve 96, hose 98 and valve 100 to which pipe 90 is connected. Valve 100 has a control lever 106 which, in the position shown in Figure 1, has valve 100 in the closed position so that no air is being supplied to pipe 90. When the control lever is moved to the position shown by the dotted lines at 108, air under pressure is supplied to pipe 90. With the control lever in the position indicated by dotted lines 110, pressure is cut off from pipe 90 which is connected to exhaust vent 112 so as to exhaust pressure in pipe 90 and bag 84.

As best seen in Figures 1 and 8, cover 30 is provided with a crossbar 114 which is secured to a pair of brackets 116, 116 attached to the side plates 34, 34, respectively. Crossbar 114 can be utilized to raise and lower cover 30.

As shown in Figures 2 and 8 through 10, plate assembly former 2 is provided with a securing mechanism 120 for holding the cover 30 in the lowered or operating position. Securing mechanism 120 has a transverse rod 122 slidably mounted in brackets 124, 124. A pair of arms 126 are fixedly secured to rod 122 and each carries adjacent its lower end a conical shaped pin 128. Each pin 128 is adapted to pass through openings 130, 132 in a saddle member 134 and pass through a tapered opening 136 in an extension member 138 of cover 34.

The mechanism 120 is operated by a handle 140 secured to a ring 142 which, in turn, is fixedly secured to rod 122. A cylindrical hammer member 144 is slidably mounted on rod 122 in order to permit hammering against ring 142 to assist in opening the securing mechanism 122. A ring 146 is fixedly secured to rod 122 in order to permit hammer 144 to be used to effect a tight closing of securing mechanism 120. Ring 142 is positioned on rod 122 to act as a stop to limit the right-hand travel of rod 122 (as viewed in Figure 8) when it engages the right-hand bracket 124. The amount of travel to the right is sufficient to permit the disengagement of each pin member 128 from the adjacent extension member 138 but insufficient to retract it from opening 130 in the adjacent saddle 134.

After cover 30 has been secured in the closed position by securing mechanism 120 and when air under pressure is admitted to bag 84, securing mechanism 120 is locked in the closed position by a locking mechanism 148 (Figure 3) in order to prevent the inadvertent opening of cover 30 while bag 84 is under pressure. Locking mechanism 148 is provided with a plunger 150 which is secured to a piston 152 in cylinder 154. Cylinder 154 is connected to line 90 by means of a line 156. Thus when air is admitted to the line 90, it also flows through line 156 and forces piston 152 to the left as viewed in Figure 3 and, in turn, forces rod 150 to a position next to the adjacent arm 126. As best seen in Figure 2, this prevents the movement of the securing mechanism 120 to effect the withdrawal of pins 128 from their position in engagement with cover 30. The resistance of plunger 150 to lateral thrust is strengthened by bracket 158 which has an opening 160 through which plunger 150 passes. A coil spring 161 acts to move plunger 150 clear of arm 126 when the pressure is relieved in line 156.

Solenoid valve 96 acts to keep closed off the supply of air from hose 94 to hose 98 until the cover 30 is down and in the secured position in order to prevent accidental inflation of bag 84 before the cover is in the correct operating position. Solenoid valve 96 is connected to a power circuit indicated at 162 in which there is placed a mercury switch indicated at 164. Mercury switch 164 is secured to a lever 166 which is pivoted on arm 168 at 170. The right-hand end of lever 166 is biased downwardly as viewed in Figure 1 by a rod 172 mounted in opening 174 in base 4 and pivotally connected to lever 166 by a pin 176 in slot 178. A compression coil spring 180 is secured to rod 172 and has one end abutting against base 4 in order to bias rod 172 downwardly. A rod 182 is pivotally secured to lever 166 at 184 and passes upwardly through base 4 and the adjacent bracket 124, the rod being free to move up and down with lever 166 and there being sufficient play to take care of the slight pulling of rod 182 off the vertical incident to the movement of lever 166. Rod 182 is engaged by cam face 186 on the underside of rod 122. As best seen in Figure 10, when rod 122 was moved to the left into locking position, rod 182 is cammed downwardly by cam face 186 which pivots lever 166 which, in turn, by tilting mercury switch 164, energizes circuit 162 causing solenoid valve 96 to open. This results in providing air under pressure from hose 94 to hose 98 and control valve 100. Conversely, when rod 122 is moved to the right as viewed in Figure 10 in order to permti the raising of cover 30, spring 180 biases lever 166 and forces rod 122 upwardly against the flat portion of cam face 186 and thus acts to open switch 164, deenergize circuit 162 and cause solenoid valve 96 to close.

Referring now to Figures 1, 4 and 5, mechanical stop means indicated at 188 act to prevent control lever 106 of valve 100 from being raised as viewed in the figures to the position indicated at 108 in which air under pressure is supplied to pipe 90. Stop mechanism 188 has a plunger 190 which is slidably mounted in brackets 192 and 194. At its upper end plunger 190 is connected to a pair of links 196 which, in turn, are connected to a pair of upstanding links 198, 198, respectively. Links 198 are pivotally secured to bracket 194 at 200. Plunger 190 is biased downwardly by a compression coil spring 202 which has one end abutting against bracket 194 and the other end abutting against a washer 204 secured to plunger 190. When cover 30 is in the open or raised position, spring 202 forces lever 190 downwardly which, in turn, causes links 196, 196 to pivot links 198, 198 outwardly towards the control lever 106 sufficiently far so that the curved end portions 206, 206 of levers 198, 198 project outwardly far enough to prevent the ball 208 on lever 106 from being raised upwardly beyond the "valve closed" position.

Operation

In employing the apparatus in accordance with this invention, a printing plate 212 is first curved into an arc having a radius approaching the outer surface of the base plate support 12 through the use of, for example, a conventional 3-roll bender indicated schematically at 214 in Figure 12. Base plate 216 containing registering pins 218 in openings 220 is then placed over base plate support 12. As will be seen, base plate 216 fits closely against support 12. Printing plate 212 with a dry sheet 222 of a thermosetting resin is placed over base plate 216 with the registering pins 218 in registering openings 224 in printing plate 212. Small openings 226 are cut in sheet 222 to permit the free passage of the pins 218.

Cover 30 is then lowered and locked into position by moving rod 122 of securing mechanism 120 to the left, as viewed in Figure 8, in order to engage pins 128 with openings 136 in extension members 138. The movement of rod 122 causes the downward camming of rod 182 by cam face 186. This pivots lever 166 causing the tilting of mercury switch 164 sufficiently to close the switch

energizing circuit 162 which causes solenoid valve 96 to open.

The lowering of cover 30 against base 4 causes the upward movement of plunger 190 resulting in the withdrawal of curved end portions 206 of levers 198 to be withdrawn so as to free ball 208 and lever 106 of valve 100 for upward movement. Lever 106 is now moved upwardly into the position shown at 108 in Figure 1 to open valve 100 to supply air under pressure to pipe 90. This results in the inflation of bag 84 and forces printing plate 212 and sheet 222 downwardly against base plate 216 into the position shown in Figure 1 where it will be appreciated the thicknesses of the printing plate 212, adhesive sheet 222 and base plate 216 are not in proper proportion due to the limitations of the drawing, the base plate and the adhesive sheet being relatively thinner in comparison to the base plate.

The adhesive sheet 222 of partially cured thermosetting resin, for example, a phenolic-polyamide or a polyamide-epoxy resin, is subjected to heating by the heating elements 18 which were preheated to the desired temperature before the printing plate assembly was placed in the apparatus.

The supplying of air under pressure to line 90 also acted to move piston 152 and plunger 150 to the left as viewed in Figure 3 to position the plunger immediately next to the adjacent arm 126 and hence prevent the unlocking of cover 30.

The assembly of printing plate 212, adhesive sheet 222 and base plate 216 is subjected to heat and pressure as indicated above until the thermosetting resin has set, normally a period of a few minutes. Then lever 106 and valve 100 are moved down to the position indicated at 110 in Figure 1 which permits the exhaustion of bag 84 through line 90, valve 100 and vent 112. The release of this pressure simultaneously permits spring 161 to move piston 152 to the right as viewed in Figure 3 which retracts plunger 150 so as to permit the operation of securing mechanism 120. Rod 122 is now moved to the right as viewed in Figure 8 through the use of handle 140 and hammer 144, if necessary, so as to withdraw pins 128 from openings 136 in cover 30. This action causes cam face 186 to be moved to the right as viewed in Figure 10 which permits the upward movement of rod 182 due to the urging of spring 180 against lever 166. This, in turn, tilts mercury switch 164 to open circuit 162 which, in turn, results in the closing of solenoid valve 96. The thus completed assembly of the base plate and printing plate is removed and cooled and the registering pins removed. The thus formed assembly is now ready to be placed on a rotary web letter press.

It is not desired to be limited except as set forth in the following claims.

What is claimed is:

1. A printing plate assembly former adapted to form an assembly of a printing plate, an adhesive and a backing plate comprising: a base plate support adapted to support a curved base plate, heating means to apply heat to an adhesive between the base plate and a printing plate, a cover adapted to enclose the base plate mounted on the base plate support, said cover being pivotally mounted at one end, means to lock said cover in the closed position, said locking means comprising a pin adapted to slidably engage and hold said cover, an expandible bag within said cover and adapted to overlie said base plate, pressure means to expand said expandible bag towards said base plate to force a printing plate against an adhesive overlying said base plate to form an intimate assembly of the printing plate, adhesive and base plate, and plunger means responsive to pressure to prevent the retraction of said pin when the expandible bag is expanded.

2. A printing plate assembly former adapted to form an assembly of a printing plate, an adhesive and a backing plate comprising: a base plate support adapted to support a curved base plate, heating means to apply heat to an adhesive between the base plate and a printing plate, a cover adapted to enclose the base plate mounted on the base plate support, means to lock said cover in the closed position, an expandible bag within said cover and adapted to overlie said base plate and means to expand said expandible bag towards said base plate to force a printing plate against an adhesive overlying said base plate to form an intimate assembly of the printing plate, adhesive and base plate, said expanding means comprising a fluid pressure system, a control valve in said system, a solenoid valve in the system on the supply side of said control valve, switch means activated by said locking means to close the solenoid valve when the cover is unlocked and open it when the cover is locked.

3. A printing plate assembly former adapted to form an assembly of a printing plate, an adhesive and a backing plate comprising: a base plate support adapted to support a curved base plate, heating means to apply heat to an adhesive between the base plate and a printing plate, a cover adapted to enclose the base plate mounted on the base plate support, means to lock the cover in the closed position, an expandible bag within said cover and adapted to overlie said base plate, and means to expand said expandible bag towards said base plate to force a printing plate against an adhesive overlying said base plate to form an intimate assembly of the printing plate, adhesive and base plate, said expanding means comprising a fluid pressure system, a manual control valve in said system, a solenoid valve in the system on the supply side of said control valve, switch means activated by said locking means to close the solenoid valve when the cover is unlocked and open it when the cover is locked, said control valve having an operating handle, spring biased retractable means adapted to limit the movement of said handle when the lid is open.

4. A printing plate assembly former adapted to form an assembly of a printing plate, an adhesive and a backing plate comprising: a base plate support adapted to support a curved base plate, heating means to apply heat to an adhesive between the base plate and a printing plate, a cover adapted to enclose the base plate mounted on the base plate support, said cover being pivotally mounted at one end, means to lock said cover in the closed position, said locking means comprising a saddle member having transverse openings secured to the base plate support, an extension member secured to the cover having a transverse opening adapted to be in registry with the openings in the saddle member when the cover is closed, a rod mounted for transverse movement, an arm secured to said rod, a conical shaped transverse pin secured to said arm and adapted to engage the openings in said saddle member and extension member to lock the cover in the closed position, an expandible bag within said cover and adapted to overlie said base plate, and means to expand said bag towards said base plate to force a printing plate against an adhesive overlying said base plate to form an intimate assembly of the printing plate, adhesive and base plate.

5. A printing plate assembly former adapted to form an assembly of a printing plate, an adhesive and a backing plate comprising: a base plate support adapted to support a curved base plate, heating means to apply heat to an adhesive between the base plate and a printing plate, a cover adapted to enclose the base plate mounted on the base plate support, said cover being pivotally mounted at one end, means to lock said cover in the closed position, said locking means comprising a saddle member having transverse openings secured to the base plate support, an extension member secured to the cover having a transverse opening adapted to be in registry with the openings in the saddle member when the cover is closed, a rod mounted for transverse movement, an arm secured to said rod, a conical shaped transverse pin secured to said arm

and adapted to engage the openings in said saddle member and extension member to lock the cover in the closed position, an expandible bag within said cover and adapted to overlie said base plate, and means to expand said bag towards said base plate to force a printing plate against an adhesive overlying said base plate to form an intimate assembly of the printing plate, adhesive and base plate, said expanding means comprising a fluid pressure system, a control valve in said system, a solenoid valve in the system on the supply side of said control valve, switch means spring biased to close said solenoid valve, an operating member connected to said switch, a cam surface on said rod engaging said operating member to actuate the switch to open the solenoid valve when the rod is positioned to lock the cover.

6. A printing plate assembly former adapted to form an assembly of a printing plate, an adhesive and a backing plate comprising: a base plate support adapted to support a curved base plate, heating means to apply heat to an adhesive between the base plate and a printing plate, a cover adapted to enclose the base plate mounted on the base plate support, an expandible bag within said cover and adapted to overlie said base plate, and means to expand

said expandible bag towards said base plate to force a printing plate against an adhesive overlying said base plate to form an intimate assembly of the printing plate, adhesive and base plate, said expanding means comprising a fluid pressure system, a manual control valve in said system, said control valve having an operating handle, a plurality of retractable links adapted to limit the movement of said operating handle when the cover is open, a rod operably connected to said links, said rod being adapted to engage the base plate support when the cover is closed to cause the rod to move upwardly and retract said links, and spring means biasing the links in the unretracted position.

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