(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 297 596 A2**

# (12) EUROPEAN PATENT APPLICATION

(21) Application number: **88110508.4**

(51) Int. Cl.⁴: **B21D 51/26 , B21D 22/30**

(22) Date of filing: **30.06.88**

(30) Priority: **01.07.87 US 69840**
**30.11.87 US 126280**

(43) Date of publication of application:
**04.01.89 Bulletin 89/01**

(84) Designated Contracting States:
**AT BE CH DE FR GB IT LI NL SE**

(71) Applicant: **ADOLPH COORS COMPANY**
**17755 West 32nd Avenue**
**Golden Colorado 80401(US)**

(72) Inventor: **Grims, Conrad M.**
**1027 North Jackson Street**
**Golden Colorado 80403(US)**
Inventor: **Johansson, Bert**
**689 Golden Gate Drive**
**Golden Colorado 80403(US)**

(74) Representative: **Baillie, Iain Cameron et al**
**c/o Ladas & Parry Isartorplatz 5**
**D-8000 München 2(DE)**

## (54) Can body making apparatus.

(57) A redraw apparatus is provided for a can body making apparatus wherein the redraw carriage of the redraw apparatus is mounted for substantially friction-free sliding reciprocating movement over a pair of spaced apart support posts which are fixedly mounted on the housing holding the can forming and ironing dies. Also, a counterbalancing system is provided for applying a force to counterbalance the weight of a portion of structures used to reciprocate the redraw carriage. Additionally, a ram assembly is provided for supporting a ram for movement through the redraw apparatus and the can forming and ironing dies wherein a pair of spaced apart elongated shafts are fixedly mounted and a ram carriage having the ram attached thereto is provided with liquid bearings for mounting the ram carriage on the elongated shafts for substantially friction free movement thereover. A guide liquid bearing is also used to ensure proper alignment of the ram.

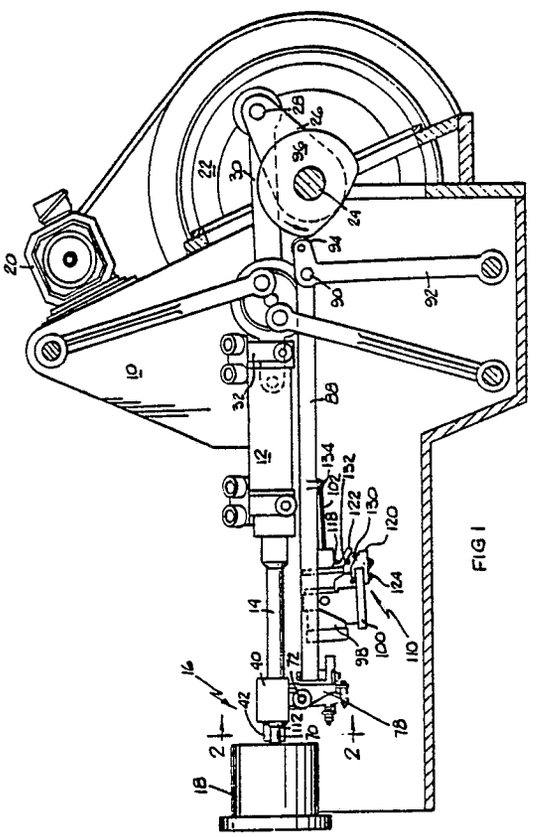


FIG 1

EP 0 297 596 A2

# CAN BODY MAKING APPARATUS

This invention relates generally to a can body making apparatus and more particularly to an improvement in the ram assembly apparatus for maintaining more accurate alignment of the ram during the reciprocation thereof and in the redraw apparatus for providing and maintaining more accurate alignment of the can blanks with the ram and the tool pack containing the can forming and ironing dies.

A can body making apparatus is disclosed in U.S. Patent No. 3,696,657. The ram carriage and redraw carriage are each mounted on rollers which move over carriage way strips. Each pair of upper and lower rollers are urged toward each other so as to be in firm contact with the carriage way strip located therebetween. Both the ram and redraw carriages are reciprocated at rates sufficient to form about two hundred cans a minute. The constant reciprocal movement of the ram and redraw carriages and the tight engagement of the rollers on the carriage way strips result in wear which causes misalignment of the ram or of the can blanks by the redraw sleeve. It is understood that this misalignment is small, between about 0.005 and 0.010 of an inch, but such misalignment can result in defective cans.

This invention provides ram assembly means for a can body making apparatus wherein ram means are mounted on ram carriage means which have a pair of liquid bearing means for mounting the ram carriage means for reciprocal movement over a pair of fixedly mounted, spaced apart, elongated shafts. Also, guide means, such as liquid bearing means, are provided for guiding the reciprocal movement of the ram means therethrough.

This invention also provides a redraw apparatus for a can body making apparatus wherein the redraw carriage is slidably mounted on a pair of spaced apart support posts for reciprocal movement thereover, which support posts are fixedly mounted on the housing holding the can forming and ironing dies. The invention also provides counterbalancing means for supporting at least a major portion of the weight of the redraw actuating rod, also known as the push rod, to substantially eliminate the weight on the carriage sleeve for more efficient operation.

In the preferred embodiment of the invention, ram assembly means are provided for a can body making apparatus having means for reciprocating a ram carriage means and a ram means along their longitudinal axes so that the ram means push a can blank through can forming and ironing dies to form a can body. The ram assembly means include a pair of spaced apart, elongated shafts having generally cylindrical outer surfaces and which are fixedly mounted on a fixed frame means. The ram means are mounted on a ram carriage means that have a pair of spaced apart liquid bearing means each having a cylindrical inner surface for reciprocal movement over the elongated shafts. The liquid bearing means has a plurality of arcuately shaped pocket means, each of which is supplied with a liquid, preferably from the coolant supply of the can body making apparatus, at suitable pressures. Each liquid bearing means also has liquid return means for removing the liquid supplied to the pocket means. Guide means, preferably comprising liquid bearing means, are fixedly mounted on the frame means and are located so that the ram means are supported for reciprocal movement therethrough. A redraw carriage including a redraw sleeve is located between the ram assembly means and the can forming and ironing dies and functions to hold a can blank in the proper position against the can forming and ironing dies so that the ram means will push the can blank through the can forming and ironing dies to form a can body. The redraw apparatus includes a redraw carriage that is provided with a pair of spaced apart bearings having generally cylindrical inner surfaces. A pair of spaced apart support posts are fixedly mounted on the housing holding the can forming and ironing dies and have generally cylindrical outer surfaces. The redraw sleeve is slidably mounted on the spaced apart support posts for substantially friction free movement thereover. The longitudinal axes of the spaced apart support posts and bearings are parallel to the longitudinal axis of the ram means and the redraw sleeve holds the can blank so that the longitudinal axis thereof is aligned with the longitudinal axis of the ram means. Reciprocating means are provided for providing reciprocal movement of the redraw carriage over the spaced apart support posts. A counter-balancing means, comprising a plurality of springs mounted in a fixed position and applying a force against a portion of the reciprocating means, removes substantially all of the weight on the redraw carriage to virtually eliminate wear of the bushings and posts.

An illustrative and presently preferred embodiment of the invention is shown in the accompanying drawing in which:

Fig. 1 is a side elevational view;

Fig. 2 is an elevational view with parts in section taken on the line 2-2 of Fig. 1;

Fig. 3 is an elevational view with parts in section taken along the line 3-3 of Fig. 2;

Fig. 4 is a top plan view of a portion of Fig. 2;

Fig. 5 is a side elevational view of a plate means forming a part of the counterbalancing means;

Fig. 6 is a side elevational view of the spring holding means of the counterbalancing means;

Fig. 7 is a front elevational view of Fig. 5;

Fig. 8 is a front elevational view of Fig. 6;

Fig. 9 is a top plan view of the ram assembly means to be substituted for those in Fig. 1;

Fig. 10 is a top plan view of the ram carriage means of Fig. 9;

Fig. 11 is a left side elevational view of Fig. 10;

Fig. 12 is a right side elevational view of Fig. 10;

Fig. 13 is a cross-sectional view taken on the line 13-13 of Fig. 9;

Fig. 14 is a cross-sectional view taken on the line 14-14 of Fig. 13; and

Fig. 15 is a cross-sectional view of the manifold means taken on the line 15-15 of Fig. 9.

In the apparatus illustrated in Fig. 1, a frame 10 has a ram carriage 12 mounted thereon for reciprocating movement over a pair of spaced apart opposed way strips (not shown). The ram carriage 12 has a ram 14 mounted thereon so that during the forward stroke, the ram 14 will pass through the redraw apparatus 16, having a cup feeding means 17, and through the housing 18 containing the can forming and ironing dies similar to those in U.S. Patent No. 3,735,629. The mechanism for reciprocating the ram carriage 12 includes the motor 20, the pulley wheel 22, the crank shafts 24, the crank arms 26, the crank pins 28, the main connecting rod 30 and cross-head members 32, all of which are conventional.

The redraw apparatus 102 of this invention is illustrated in Figs. 1 - 4 and comprises a redraw carriage 40 having a conventional redraw sleeve 42. The redraw carriage 40 is provided with a pair of spaced apart longitudinally extending bores 44 and 46 which are located on both sides of bushing 48 mounted in the redraw carriage 40. One end of each bore 44 and 46 is enlarged and bearing means 50 and 52 are fixedly mounted therein. The bearing means 50 and 52 preferably comprise a hardened steel bushing having a cylindrical inner surface 54. The redraw carriage 40 is also provided with a pair of bores 56 in which are mounted rocker pivots 58 similar to those in the Maytag patent. The redraw carriage 40 also is provided with passageways 60. A rocker arm 62 similar to the one in U.S. patent 3696657 has extensions 64 which extend through the passageways 60 and are pivotally mounted on the rocker pivots 58 to provide the force to reciprocate the redraw carriage 40.

A pair of spaced apart support posts 70 and 72 are fixedly mounted on the housing 18 holding the can forming and ironing dies (not shown). Each of the support posts 70 and 72 has a cylindrical outer surface 74 and has a longitudinal axis extending parallel to the longitudinal axis of the ram 14. The redraw carriage 40 is slidably mounted on the support posts 70 and 72 by placing the bearing means 50 and 52 over the support posts 70 and 72. Conventional fittings 76 are provided for supplying lubrication for the bearing means 50 and 52. This slidable mounting of the redraw carriage, as illustrated in Figs. 1 - 4, is substantially friction-free and minimizes any wear caused by the reciprocating movement of the redraw carriage so that proper alignment of the redraw sleeve with the ram assembly and the housing holding the can forming and ironing dies is maintained.

The redraw carriage 40 is reciprocated by conventional mechanism as illustrated in Figs. 1 - 3. The rocker arm 62 is attached to a shoe 78 which supports the conventional movement arresting means 80 including the spring 82 and adjustable stop screw 84. The shoe 78 is attached to the end 86 of the actuating rod 88 and the end 90 of the actuating rod 88 is pivotally connected to the cam follower lever 92 having a cam follower 94 which is urged against a cam 96 rotated by the wheel 22. An air cylinder 98 is mounted on a fixed support 100 with the free end of its piston rod 102 pivotally connected to the actuating rod 88 at approximately the mid-point thereof. The air cylinder 98 exerts a constant force on the actuating rod 88 through the piston rod 102 to maintain the cam follower 94 in contact with the cam 96 to provide the reciprocating movement to the redraw carriage 40.

A counterbalancing means 110, illustrated in Figs. 1 and 5 - 8, is provided for applying a force on the redraw actuating bar 88 so as to substantially eliminate any weight on the redraw carriage 40. The counterbalancing means 110 comprises an angularly shaped member 112 having passageways 114 and 116 so that it may be secured by headed bolts 118 to the housing of the air cylinder 98. A support member 120 having a U-shaped opening 122 is positioned on the support 100 and secured thereto by a set screw 124. A plurality of holes 126 are formed in the support member 120 and extend partially therethrough and have openings in the upper surface 128 thereof. A coiled spring 130 is located in each hole. As illustrated in Fig. 1, the support member 120 is located relative to the member 112 so that the coiled springs 130 are in contact with a generally planar bottom surface 132 on the member 112. Pivot means 134 are provided for pivotally connecting the end of the piston rod 102 to the redraw actuating bar 88. This pivot means 134 is connected to the redraw actuating bar 88 at a generally central location. The coiled springs 130 function to provide a force on

the member 112 so as to counterbalance the weight of the redraw actuating bar 88 and its associated structures so that there is substantially no weight placed on the redraw carriage 40. Set screws 136 are threadedly mounted in threaded bores 138 in the support member 120 so that the ends thereof are in contact with the coiled springs 130 so that the amount of force being applied by the coiled springs 130 may be adjusted. This counterbalancing means 110 virtually eliminates any wear of the bushing means 50 and 52 and the support posts 70 and 72 so that proper alignment of the redraw sleeve with the ram assembly and the housing holding the can forming and ironing dies is maintained.

The redraw carriage 40 and the redraw sleeve 42 are reciprocated over the support posts 70 and 72 to position a can blank (not shown) to be contacted by the ram 14 and be pushed through the can forming and ironing dies in the housing 18 to form a can body.

Ram assembly means 150, to be substituted for the ram assembly means of Fig. 1, are illustrated in Fig. 9 and comprise a fixed support frame means 152 secured to a foundation (not shown). A pair of spaced apart, elongated shafts 154 and 156 are secured at a fixed location on the support frame means 152 by suitable means (not shown). The elongated shafts 154 and 156 have generally cylindrical outer surfaces 158 and 160. Ram carriage means 170 are illustrated in Figs. 10 - 12 and include a generally rectangularly shaped central body portion 172 and two end members 174 and 176 having arcuately shaped end surfaces 178. Liquid bearing means 180 and 182 are secured to the arcuately shaped end surfaces 178 by suitable means, such as by welding. The liquid bearing means 180 and 182 have a plurality of liquid inlet means 184 and a plurality of liquid outlet means 186 for purposes described below. Also, the top surfaces 188 and 190 of the liquid bearing means 180 and 182 are generally planar and are provided with a plurality of threaded bores 192 for mounting a manifold means thereon as described below. A central recess 194 is formed in the end member 174 and has a plurality of spaced apart threaded bores 196 for mounting the ram means as described below. A central cavity 198 is formed in the end member 176 and is dimensioned to be coupled to the drive means for reciprocating the ram carriage means 170 as described below.

Manifold means 200, illustrated in Figs. 9, 13 and 15, are secured to the top surfaces 188 and 190 by suitable means (not shown) such as threaded bolts in the threaded bores 192. The manifold means 200 has a main body portion 202 having a liquid inlet means 204 and a liquid outlet means 206. A passageway 208 receives liquid from the liquid inlet means 204 and distributes the liquid through branch passageways 210 through the liquid inlet means 184 of the liquid bearing means 180 and 182 to an annular passageways 212. Liquid is removed from the liquid bearing means 180 and 182 through a passageway 214 connected to branch passageways 216 which receive liquid from radially extending passageways 218 in fluid communication with the liquid outlet means 186 in the liquid bearing means 180 and 182 and pass such liquid through liquid outlet means 206 and then to a drain basin, as described below.

The liquid bearing means 182 are illustrated more particularly in Figs. 13 and 14 and comprise a hollow elongated housing means 230 having the generally planar top surface 190 and a generally cylindrical inner surface 232 having a centrally located radially inwardly projecting flange portion 234. Two liquid bearing members 236 each having a generally cylindrical outer surface 238 having substantially the same diameter as the generally cylindrical surface 232 are positioned in mating relationship therewith and in abutting relationship with the flange portion 234. An end closing member 240 having an axially inwardly projection portion 242 is secured to the elongated housing by suitable means (not shown), such as bolts in threaded bores, to restrict the flow of the liquid out of the bearing members 236 so that the liquid will flow through the liquid outlet means 186. Each liquid bearing member 236 has a generally cylindrical inner surface 244 in which are formed a plurality of spaced apart pocket cavities 246 each of which has an arcuate surface 248 which is a portion of a cylindrical surface having an axis offset from the axis of the general cylindrical inner surface 244. A centrally located radially extending passageway 250 is in fluid communication with each pocket cavity 246 and the annular passageway 212. Suitable fittings (not shown) are mounted in each passageway 250 to control the flow of liquid into each pocket cavity 246. Access openings 254 are provided for permitting insertion or adjustment of the fittings and when the bearings are in use, these access openings 254 are sealed with plug means (not shown).

Ram means 260 are illustrated in Fig. 9 and comprise a ram 262 having a generally cylindrical outer surface 264 having substantially the same diameter as the inner diameter of the can body to be formed. The ram 262 has an integral flanged portion 266 which is positioned in the central recess 194 and secured therein by suitable means (not shown) such as bolts secured in the threaded bores 196. Guide means 268 are fixedly mounted in support members 270 fixedly secured to the support frame means 152. The guide means 268 comprise liquid bearing means 272 similar to liquid

bearing means 180 and 182 except that the housing means thereof contains only one liquid bearing member 236. Manifold means (not shown) will provide liquid to the liquid inlet means 184 and remove liquid from the liquid outlet means 186. The longitudinal axes of the elongated shafts 154 and 156, the liquid bearing means 180, 182 and 272 and the ram means 260 are in parallel relationship with each other. A ball and socket means 274 is used to connect the end member 176 to the main connecting rod 30. It is understood that suitable fittings and sealing members are used where necessary to control the flow of the liquid. In the preferred embodiment, the liquid used is taken from the pool of coolant used conventionally with can body making apparatus.

In the operation of the apparatus illustrated in Figs. 9 - 15, the ram carriage assembly 150 is mounted on the fixed support frame means 152 so that the front end portion 276 of the ram 262 will pass through the redraw apparatus 16 and the housing 18 containing the can forming and ironing dies.

Liquid conducting means 276 are connected to the liquid inlet means 204 and a coolant storage tank 278 to provide coolant from the coolant storage tank 278 as the liquid to each of the liquid bearing means 180 and 182. The coolant is provided at suitable pressures so that the pressure in each of the pocket cavities 246 is between about 150 and 500 psi and preferably about 200 psi. The coolant comprises about 97 per cent water to which are added solubles. Liquid conducting means 280 are connected to the liquid outlet means 206 and to a drain basin 282 for removing coolant passing through the liquid bearing means 180 and 182. The connecting rod 30 applies reciprocating forces on the ram carriage means 170 so that the ram 262 moves back and forth through the redraw apparatus 16 and the housing 18 so as to form can bodies at the rate of between about 150 and 300 can bodies per minute. The liquid bearing members 236 permit substantially friction free movement of the ram carriage means over the elongated shafts 154 and 156 and ram 262 through the liquid bearing means 272 so that there is substantially no wear to cause misalignment problems. Also, the liquid bearing members 236 provide pressure equalization means so that the ram carriage means move over the elongated shaft means 154 and 156 in an equilibrium position. The ram assembly means of this invention weighs less than that illustrated in U.S. patent 3696657 so that it may be moved using substantially less power. The lighter weight also allows the reciprocation to be reversed more easily so that more cans may be produced each minute. Also, by substantially eliminating wear, downtime and maintenance are substantially reduced.

While an illustrative and presently preferred embodiment of the invention has been described in detail herein, it is to be understood that the inventive concepts may be otherwise variously embodied and employed and that the appended claims are intended to be construed to include such variations except insofar as limited by the prior art.

## Claims

1. A can body maker for forming can blanks into elongated can bodies comprising:

a can body maker having a fixedly located frame;

at least a pair of elongated shafts fixedly mounted on said frame and each having a generally cylindrical outer surface;

a ram carriage;

bearing means in said ram carriage for slidably mounting said ram carriage for reciprocal movement over said shafts;

said bearing means comprising liquid bearings and each having a generally cylindrical inner surface;

a ram fixedly mounted on said ram carriage;

reciprocating means for applying reciprocating forces to said ram carriage;

a housing having tooling and ironing dies located therein and mounted in a fixed location;

fixedly mounted guide bearing means for slidably receiving and supporting a portion of said ram;

said guide bearing means being located between said housing and said ram carriage;

a redraw assembly slidably mounted for independent reciprocal movement and located between said housing and said guide bearing means;

an opening in said redraw assembly through which said ram means passes and permitting relative sliding movement between said ram means and said redraw assembly; and

can blank feeding means on said redraw assembly for positioning a can blank so that it can be contacted by said ram and moved through said housing to form an elongated can body.

2. The invention as in claim 1, and further comprising:

at least two sets of axially spaced apart pocket formations formed in said generally cylindrical inner surface of each of said liquid bearings; and

at least four equally spaced apart pocket cavities in each set.

3. The invention as in claim 2, and further comprising:

each of said pocket cavities having an arcuate

surface that is a portion of a cylindrical surface that has an axis offset from the axis of said generally cylindrical surface of each of said liquid bearings.

4. The invention as in claim 3, and further comprising:

each of said liquid bearings having a generally planar top surface;

each of said liquid bearings having at least one liquid inlet and at least one liquid outlet in said generally planar top surface;

manifold means mounted on said generally planar top surfaces for feeding said liquid to said at least one liquid inlet;

said manifold means having at least one liquid inlet;

liquid supplying means for supplying liquid to said at least one liquid inlet of said manifold means;

a plurality of passageways in said manifold means for supplying portions of said liquid to said liquid inlet of each of said liquid bearings;

said manifold means having at least one liquid outlet; and

a plurality of passageways in each of said liquid bearings for collecting used liquid and delivering such used liquid to said liquid outlet of said manifold means.

5. The invention as in claim 4, and further comprising:

an annular passageway formed in each of said liquid bearings for receiving liquid from said liquid inlet means of each of said liquid bearings; and

liquid feeding means for feeding liquid from said annular passageway to each of said pocket cavities.

6. A can body making apparatus comprising means for reciprocating a ram assembly along its longitudinal axis, a housing holding the can forming and ironing dies and a reciprocating redraw apparatus which functions to position a can blank before the can forming and ironing dies so that the ram assembly pushes the can blank through the can forming and ironing dies wherein the redraw apparatus comprises:

housing means mounted in a fixed location for holding can forming and ironing dies;

a ram assembly;

ram reciprocation means for reciprocating said ram assembly;

at least a pair of spaced apart support posts fixedly mounted on said housing means;

said pair of spaced apart support posts projecting out of said housing means in a direction toward said ram reciprocation means;

a redraw carriage having at least a pair of spaced apart bearings fixedly mounted therein;

said pair of spaced apart bearings being slidably mounted on said pair of spaced apart support posts to provide substantially friction-free movement of said redraw carriage; and

redraw reciprocation means for reciprocating said redraw carriage.

7. The invention as in claim 6, wherein said redraw reciprocation means comprises:

an elongated redraw actuating bar;

connecting means for connecting one end of said redraw actuating bar to said redraw carriage;

a cam follower lever connected to the other end of said redraw actuating bar;

a cam follower mounted on said cam follower lever;

a rotatable cam mounted for rotation at a fixed location;

rotation means for rotating said rotatable cam;

force applying means for applying a force to said redraw actuating bar to urge said cam follower against said cam to provide said reciprocating movement to said redraw carriage; and

counterbalancing means for applying a force to said redraw actuating bar to counterbalance the weight thereof.

8. The invention as in claim 7, wherein said force applying means comprises:

an air cylinder mounted at a fixed location;

a piston rod extending outwardly from said air cylinder and urged thereby in a direction toward said cam follower means;

connecting means for pivotally connecting said piston rod to said redraw actuating bar; and

wherein said counterbalancing means comprises spring means mounted on a fixed support and applying a force on said air cylinder in a direction to counterbalance the weight of said redraw actuating bar.

9. The invention as in claim 8, wherein said counterbalancing means comprises:

an angular shaped member secured to said air-cylinder and having a generally planar bottom surface;

a spring means support member mounted in a fixed position;

a plurality of springs;

a plurality of spring support means in said spring support member, each of said support means supporting a spring;

said spring support means mounted so that said spring means are in contact with said generally planar bottom surface and exert a force thereon to counterbalance the weight of said actuating rod; and

adjusting means for varying the location of said spring support means so as to vary the force being applied to said generally planar bottom surface.

10. A can body maker for forming can blanks into elongated can bodies comprising:

a can body maker having a fixedly located frame;

at least a pair of elongated shafts fixedly mounted on said frame and each having a generally cylindrical outer surface;

a ram carriage;

bearing means in said ram carriage for slidably mounting said ram carriage for reciprocal movement over said shafts;

said bearing means comprising liquid bearings and each having a generally cylindrical inner surface;

a ram fixedly mounted on said ram carriage;

reciprocating means for applying reciprocating forces to said ram carriage;

a housing having tooling and ironing dies located therein and mounted in a fixed location;

fixedly mounted guide bearing means for slidably receiving and supporting a portion of said ram;

said guide bearing means being located between said housing and said ram carriage;

a redraw assembly slidably mounted for independent reciprocal movement and located between said housing and said guide bearing means;

an opening in said redraw assembly through which said ram means passes and permitting relative sliding movement between said ram means and said redraw assembly; and

can blank feeding means on said redraw assembly for positioning a can blank so that it can be contacted by said ram and moved through said housing to form an elongated can body; and

wherein said redraw assembly comprises:

housing means mounted in a fixed location for holding can forming and ironing dies;

a ram assembly;

ram reciprocation means for reciprocating said ram assembly;

at least a pair of spaced apart support posts fixedly mounted on said housing means;

said pair of spaced apart support posts projecting out of said housing means in a direction toward said ram reciprocation means;

a redraw carriage having at least a pair of spaced apart bearings fixedly mounted therein;

said pair of spaced apart bearings being slidably mounted on said pair of spaced apart support posts to provide substantially friction-free movement of said redraw carriage; and

redraw reciprocation means for reciprocating said redraw carriage.

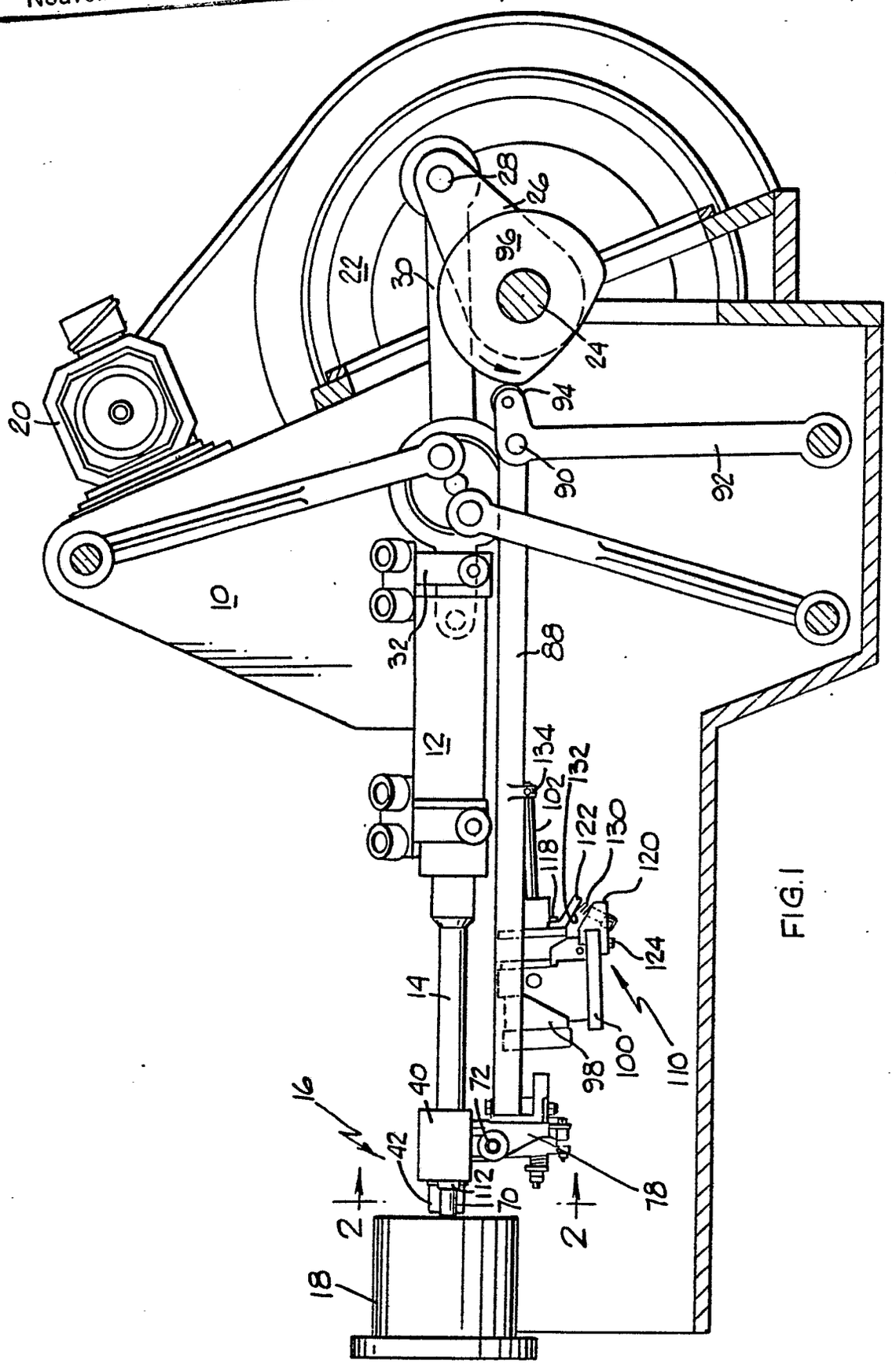



FIG. 1

FIG. 2

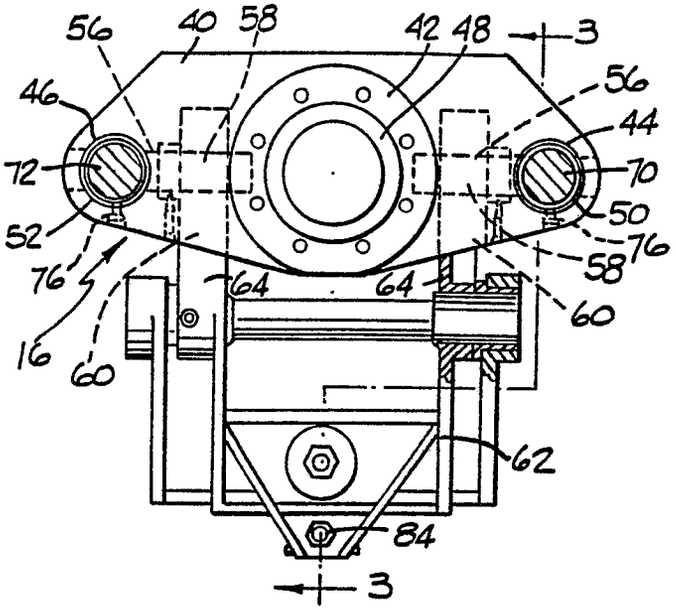



FIG. 5

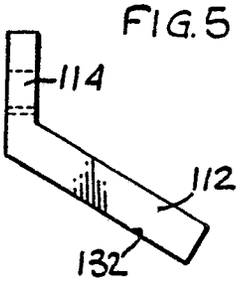



FIG. 6

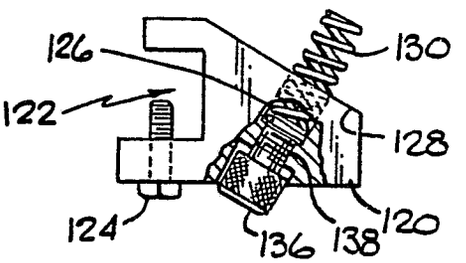



FIG. 3.

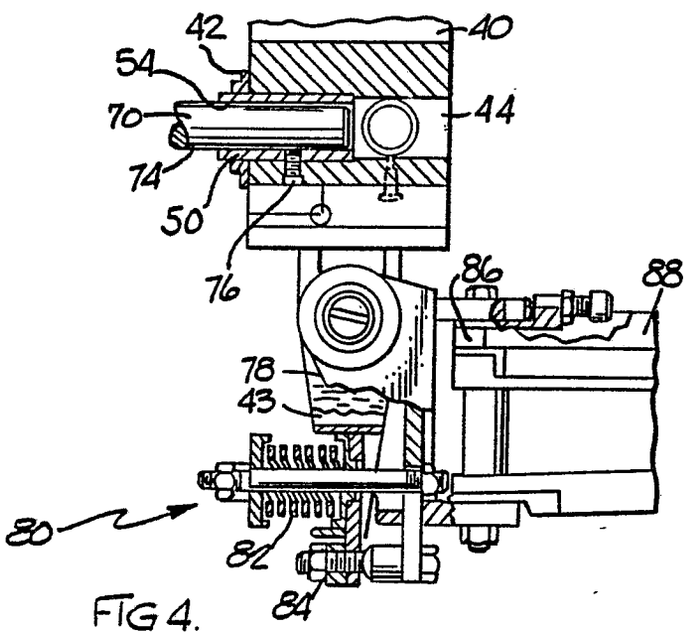



FIG. 7

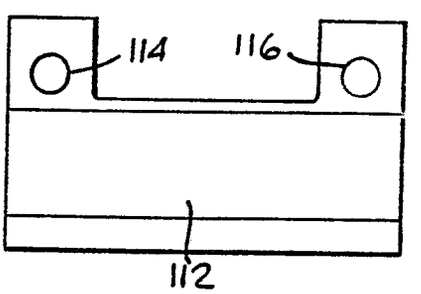



FIG 4.

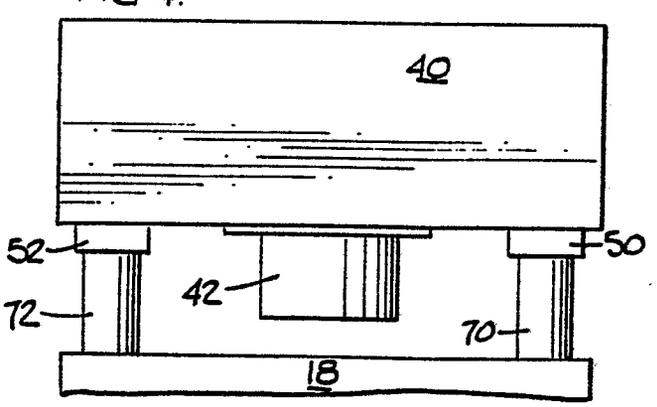



FIG. 8.

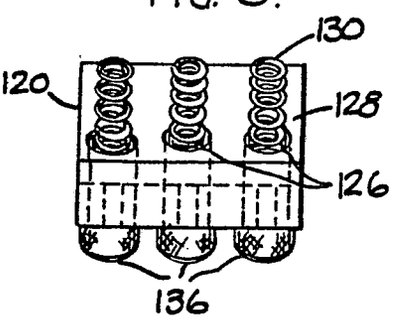
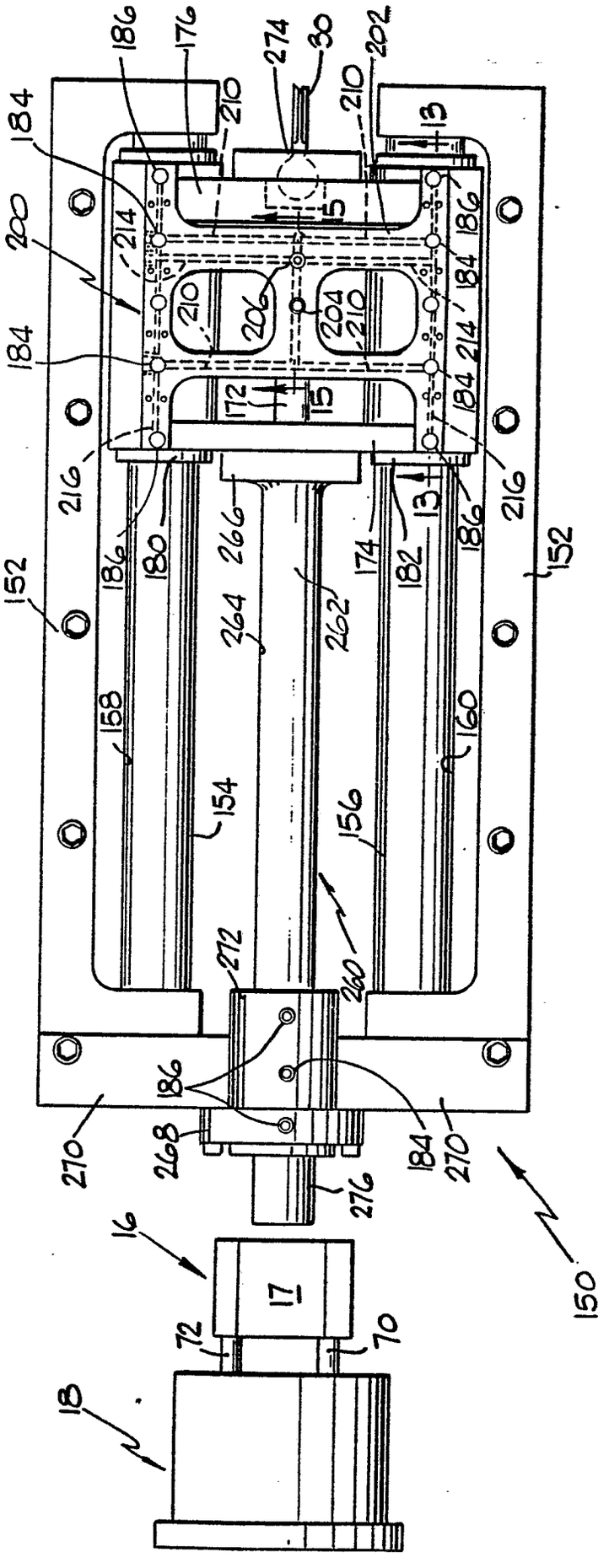


FIG.9


186
176
274
30
202
210
210
13
184
214
200
15
186
184
210
206
204
210
214
184
172
15
184
216
216
186
180
266
174
182
186
13
152
152
264
262
158
160
154
156
272
260
186
270
268
184
270
276
16
17
150
72
70
18

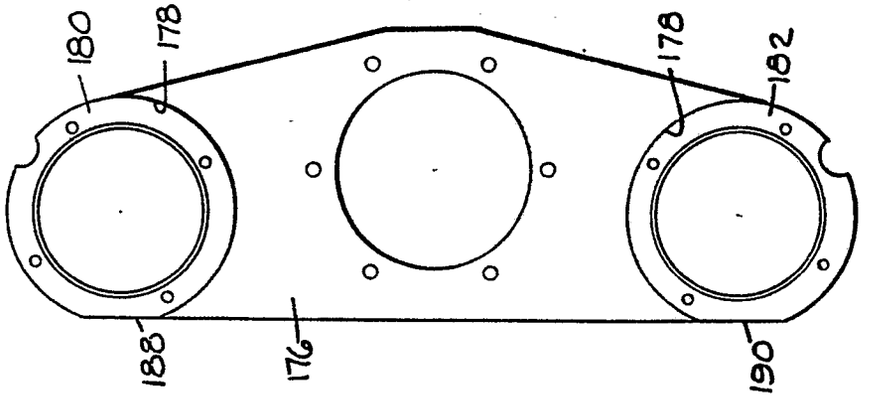



FIG. 12.

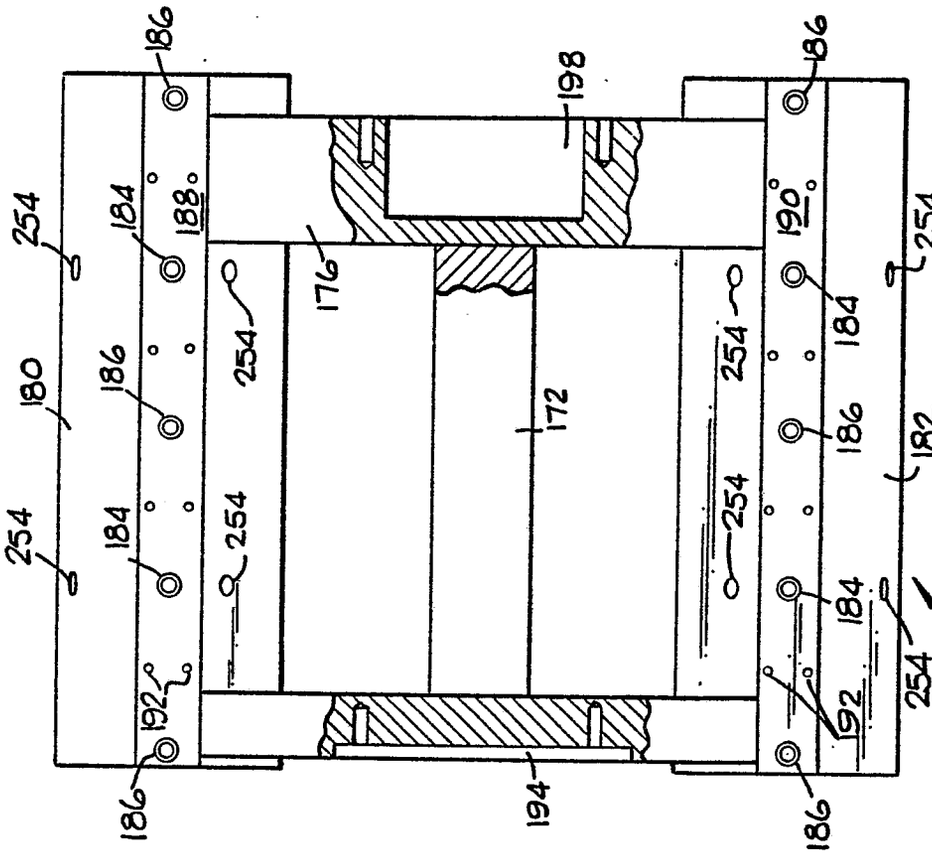



FIG. 10

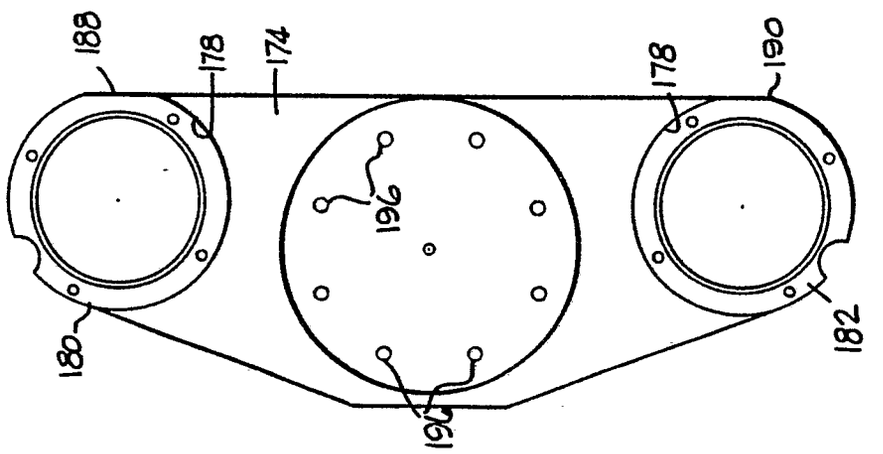



FIG. 11

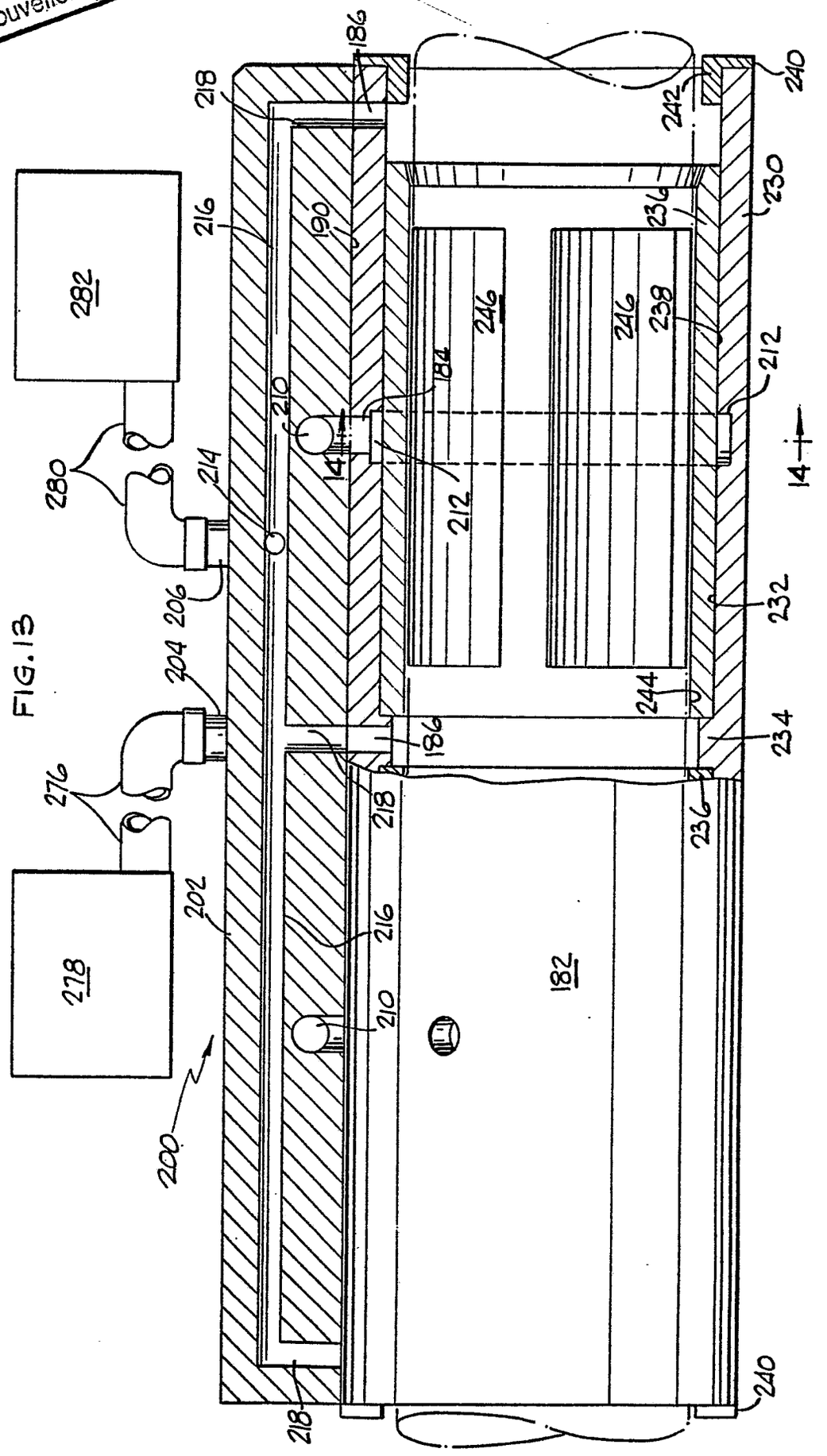



FIG. 13

FIG.15

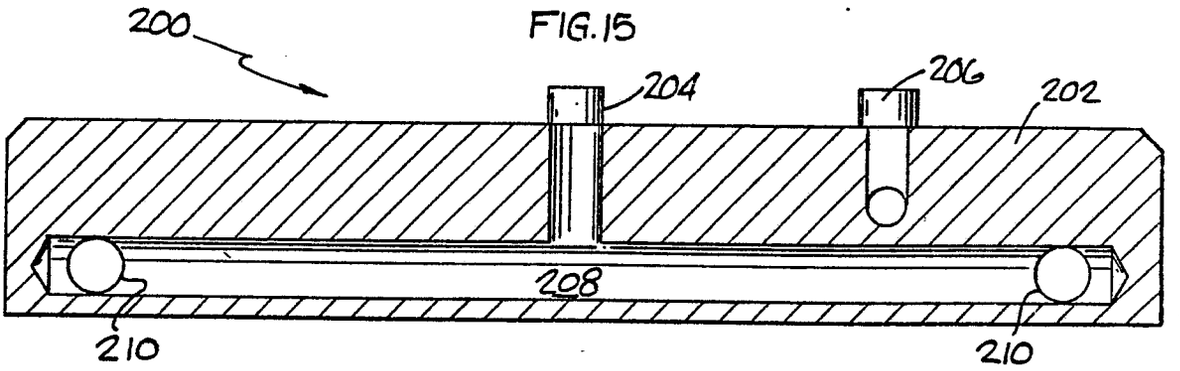



FIG.14