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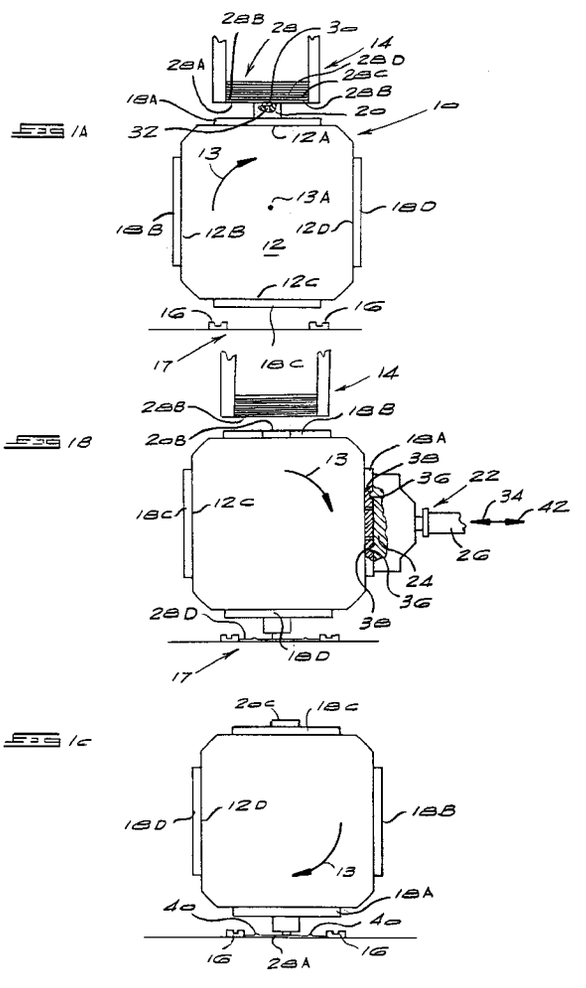
(54) Creasing unit.

(57) A creasing unit (10) is disclosed for creasing a pre-cut blank (28) for a hinge lid pack cigarette box. The creasing unit comprises a four-sided turret (12) carrying first, second, third and fourth crease-forming dies (18A, 18B, 18C, 18D). Lifting plates (20) are provided on each side of the turret for feeding blanks onto the crease-forming dies. A suction inlet (32) holds the blank in position on each crease forming die. A press (22) carries a complemental crease-forming die (24) for sandwiching the blank between the respective dies so as to sequentially form creased blanks (28A, 28B, 28C, 28D). The invention extends to a method of forming a crease in a precut blank.



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BACKGROUND TO THE INVENTION

THIS invention relates to a creasing unit, and in particular to a creasing unit for creasing blanks to be formed into cigarette boxes or the like.

The manufacture of cigarette boxes entails a relatively lengthy and involved production process. Cardboard sheets from which the blanks are to be formed are first printed and embossed. In more up-market packs, gold plate may then be applied to the appropriate areas on the printed sheets. A so-called "debossing" stage then takes place for cigarette boxes having rounded edges. In order to achieve a uniform curve between the sides of the box to be formed, the "debossing" stage involves multiple creasing in which a number of parallel creases are formed alongside one another so as to provide a rounded corner when folding takes place. The blank sheets are then cut into individual blanks and folding creases are formed in the appropriate position so as to facilitate folding of the blanks into hinge lid packs.

In view of the number of different operations performed separately on the blank sheets, there is a potential for misalignment of the sheets. The separate printing, embossing and "debossing" stages are normally performed at a separate location prior to cutting of the blanks to size. If a slight misalignment has occurred during these stages, then there is a chance that an entire batch of blanks has to be rejected.

Stacking of the pre-printed and pre-creased sheets for transportation to the cutting and folding stations may have the effect of flattening out the creases.

Furthermore, as the prepared sheets are not flat due to the various bosses and creases, they are more difficult to stack and to transport.

SUMMARY OF THE INVENTION

According to a first aspect of the invention there is provided a creasing unit for creasing a blank for a box, the creasing unit comprising:

a) a carriage carrying a first crease-forming die;

b) feed means for feeding a blank onto the crease-forming die;

c) retention means for holding the blank in position on the crease forming die;

d) a complemental crease-forming die; and

e) a press for sandwiching the blank between the crease-forming die and the complemental crease-forming die so as to form a first creased blank.

In a preferred form of the invention, the creasing unit includes drive means for driving the carriage from a first blank receiving position for receiving the first blank from the feed means to a first crease forming position in which the first crease forming die and the complemental crease forming die are brought into alignment with one another.

Preferably, the unit further includes ejection means associated with the feed means, the carriage being movable to a first blank ejecting position in which the first creased blank is ejected onto a conveyor.

Advantageously, the creasing unit is arranged to be interposed on a box forming machine between a magazine for holding uncreased pre-cut blanks and a blank bed conveyor for conveying the creased blanks to a folding station.

Typically, the carriage comprises a multi-sided turret, at least one side of the turret carrying a crease forming die, and the turret being rotatable by the drive means from the first blank receiving position to the first crease forming position to the first blank ejecting position.

The turret preferably comprises a four-sided substantially square turret having, first, second, third and fourth sides carrying respective first, second, third and fourth crease forming dies, feed means for feeding first, second, third and fourth blanks onto the first, second, third and fourth crease forming dies, retention means for holding the blanks in position on the crease forming dies, and ejection means for ejecting the creased blanks; whereby each quarter rotation of the turret by the drive means results in the first, second, third and fourth crease forming dies rotating sequentially through blank-receiving, crease-forming, blank-ejecting and idle positions.

The feed means typically comprises a reciprocating lifting plate which is movable between a retracted position in which it is substantially flush with the crease forming die and an extended position in which it is raised from the crease forming die towards a blank magazine.

The retaining means conveniently includes at least one suction inlet formed in the lifting plate and communicating with a vacuum source via a suction passage for sucking an exposed blank onto the lifting plate with the lifting plate extended and to hold the blank in position on the crease-forming die on retraction of the lifting plate, and valve means carried on the lifting plate and being actuable by contact with a lowermost blank in the blank magazine for opening the suction passage.

Typically, the complemental die is carried on the press, which is in turn mounted on a reciprocal press drive mechanism, and the turret is operated by a turret drive mechanism which is mechanically linked to the press drive mechanism so as to ensure synchronicity of operation between the turret and the press.

The invention extends to a method of forming a crease in a blank for a box comprising the steps of:

a) moving a carriage to a first blank-receiving position;

b) feeding a first blank onto a first crease-forming die supported on the carriage;

c) moving the carriage to a first crease-forming position;

d) sandwiching the first blank between the first crease-forming die and a complemental crease-forming die, thereby to form a first creased blank;

e) moving the carriage to a first blank-ejecting position; and

f) ejecting the first creased blank from the carriage.

The method preferably includes the initial step of depositing a plurality of uncreased pre-cut blanks into a magazine, and the final steps of sequentially ejecting the creased blank onto a blank bed conveyor and conveying the blanks to a folding station.

Conveniently, the method includes the further steps of:

g) moving the carriage to a second blank-receiving position;

h) feeding a second blank onto a second crease-forming die supported on the carriage;

i) moving the carriage to a second crease forming position;

j) sandwiching the second blank between the second crease-forming die and the complemental crease-forming die, thereby to from a second creased blank;

k) moving the carriage to a second blank-ejecting position; and

l) ejecting the second creased blank from the carriage.

Typically, the second blank-receiving position corresponds to the first crease-forming position, and the second crease-forming position corresponds to the first blank-ejecting position.

The method conveniently includes the step of moving the carriage to a first idle position, the first idle position corresponding to the second blank-ejecting position.

The method preferably includes the still further steps of:

m) moving the carriage to a third blank-receiving position;

n) feeding a third blank onto a third crease-forming die supported on the carriage;

o) moving the carriage to a third crease forming position;

p) sandwiching the third blank between the third crease-forming die and the complemental crease-forming die thereby to form a third creased blank;

q) moving the carriage to a third blank-ejecting position; and

r) ejecting the third creased blank from the carriage.

Conveniently, the third blank- receiving position corresponds to the first blank-ejecting position and the second crease-forming position, and the third crease-forming position corresponds to the second blank-ejecting position.

Preferably, the method includes the additional steps of:

s) moving the carriage to a fourth blank-receiving position;

t) feeding a fourth blank onto a fourth crease-forming die supported on the carriage;

u) moving the carriage to a fourth crease-forming position;

v) sandwiching the fourth blank between the fourth crease-forming die and the complemental crease-forming die thereby to form a fourth creased blank;

w) moving the carriage to a fourth blank-ejecting position; and

x) ejecting the fourth creased blank from the carriage.

Typically, the fourth blank-receiving position corresponds to the third crease-forming position, the fourth crease forming position corresponds to the third blank-ejecting position and the first blank-receiving position, and the fourth blank-ejecting position corresponds to the second blank-receiving position and the first crease-forming position.

The carriage is preferably a four-sided turret which is quarter-rotated through its various positions.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1A to 1C show three highly schematic end-on views of various stages in the operation of a creasing unit of the invention;

Figure 2 shows a more detailed front view of the creasing unit of Figures 1A to 1C;

Figure 3 shows a top plan view of the creasing unit;

Figure 4 shows a still more detailed cross-sectional side view of the creasing unit on the line

4 - 4 of Figure 3;

Figure 5 shows a cross-sectional end-on view on the line 5 -5 of Figure 3;

Figure 5A shows a cross-sectional end-on view on the line 5A-5A of Figure 3.

Figure 6 shows a partly cut-away side view of a turret and press drive mechanism;

Figure 7 shows a partly cross-sectional top plan view of the press and press drive mechanism;

Figure 8 shows a partly cut-away end-on view of the turret and press drive mechanism; and

Figure 9 shows a partly cut-away side view of the press and press drive mechanism;

DESCRIPTION OF EMBODIMENTS

Referring first to Figures 1A to 1C, a creasing unit 10 has at its heart a rotary turret 12 mounted to rotate clockwise in the direction of arrow 13 about a central axis 13A. The turret 12, which has four sides or faces 12A to 12D, is fitted to a standard Molins HLP (Hinge-Lid Pack) manufacturing machine, and is interposed between a magazine 14 and a pair of blank bed guides 16 carried on a blank bed conveyor 17. Mounted on each face or side 12A to 12D of the turret are identical female die plates 18A to 18D. A lifting plate 20 is mounted reciprocally within each female die plate, and is arranged to move between an extended position indicated in Figure 1A and a retracted position indicated in Figure 1B. An independently mounted reciprocal press 22 includes a male creasing plate 24 mounted on a pair of reciprocating rams 26.

The operation of the creasing unit 10 of the invention can briefly be described as follows. The magazine 14 is loaded with a stack of blanks 28 for forming cigarette boxes. In a first stage of operation, the lifting plate 20 is raised upwardly to a position in which it abuts the lowermost first blank 28A. A spring pin 30 carried on the lifting plate 20 is depressed as it pushes against the lowermost blank 28A, thereby actuating several vacuum or suction inlets 32 which cause the lowermost blank 28A to be sucked firmly against an upper surface of the lifting plate 20. The lifting plate 20 then retracts until it is flush with the female die plate 18A, carrying the lowermost blank 28A with it.

Referring now to Figure 1B, the turret 12 then rotates through 90° so that the female die plate 18A is in a position in which it lies adjacent the press 22. The press 22 is advanced forward in the direction of arrow 34, so as to cause the blank 28A to be sandwiched between the female creasing plate 18A and the male creasing plate 24. The female creasing plate 18A is provided with a pair of parallel channels 36 which are semi-circular in cross section. The male creasing plate 24 is similarly provided with a complemental pair of semi-circular ridges 38 which form a snug fit within the female channels 36 when the press 22 is extended, as is clear from Figure 1B. A pair of parallel semi-circular ridged corner creases 40 are thus formed in the blank 28A, as is clear from Figure 1C. The press is retracted in the direction of arrow 42, and the turret is 12 is rotated through a further 90° to its Figure 1C position, in which the female die plate 18A and blank 28A overlie the blank bed guide 16. The lifting plate 20 then extends as the suction is terminated, thereby allowing the blank 28A to fall into position on the blank bed conveyor, from where the blank is conveyed to a folding station.

It must be appreciated that the blank creasing operation is duplicated on each consecutive side 12A to 12D for each quarter rotation of the turret 12. For example, in the Figure 1B position, the female die plate 18A is brought into position beneath the magazine 14. As a result, while the male creasing plate 24 is forming the blank 28A, a lifting plate 20B extends upwardly from the female creasing plate 18B and its associated vacuum inlet is actuated so as to capture the subsequent lowermost blank 28B from the magazine 14. At the same time, the blank 28D preceding the blank 28A is being ejected onto the blank bed conveyor 17. In the Figure 1C position, the female creasing plate 18B is then brought into position adjacent the press 22 and the following female creasing plate 18C is positioned just beneath the magazine 14 in preparation for its associated lifting plate 20C to capture the next lowermost blank 28C in the stack. The leftmost position of the turret 12, corresponding to sides 12B, 12C and 12D in the respective Figures 1A to 1C, corresponds to a dormant or idle position between the eject and feed positions. The cycle as described above is repeated for each quarter rotation of the turret 12.

Turning now to Figure 2, more detailed front view of the creasing unit is shown, as is seen from the blank bed 17. The female creasing plate 18 has a centrally positioned rectangular cut-out 42 which accommodates the rectangular lifting plate 20. Ten suction apertures 44 nest within elongate depressions 46 formed in the upper surface of the lifting plate so as to distribute the suction force evenly over the area of the lifting plate.

Both the bolts for mounting the lifting plate 20 and the female creasing plate 18 have respective recessed heads 48 and 50 so as to ensure that the blank 28A lies flush with the upper surfaces of both the lifting plate 20 and the female creasing plate 18.

In Figure 3, it can clearly be seen how the magazine 14, which is bolted adjustably at 51 to the turret housing 52, is fitted with blank guides 53 and 54 for ensuring that the blanks 28 are aligned and supported correctly just prior to being fed onto the raised lifting plate 20. It is also apparent from Figure 3 how creased blanks 28A

and 28B are conveyed along the blank bed rails 16 towards the sealer bed.

Referring now to Figures 4 and 5, the turret 12 is journalled onto a central stationary shaft 54 on a pair of inner bearings 56, which are fitted between the shaft 54 and a pair of circular end plates 58 and 60. The end plates 58 and 60 are in turn journalled on a pair of outer bearings 62 to mounting plates 64 and 66 forming part of the turret housing 52. The suction apertures 44 formed in each lifting plate 20 merge into passageways 70 which terminate at one end of a sprung valve 72 which is operated by means of the pin 30. Depression of the pin 30 causes the valve 72 to open, thereby allowing the passageways 70 to communicate with a central passageway 74 which extends axially through a spigot 76.

The spigot 76 forms the innermost portion of the lifting plate 20, and nests within a complemental cylinder 78 which extends radially into one branch 79A of a central cruciform hub 80, the other three branches 79B of which have identical cylinders formed therein.

The central hub 80 is in turn bolted to a collar 82 which surrounds and is mounted rotatably to the shaft 54. The collar 82 has four equispaced apertures 83A, 83B, 83C and 83D formed therein. In the position indicated in Figure 5, the aperture 83A communicates between the cylinder 78 and an almost semi-circular passageway 84 formed in the outer surface of the shaft. The passageway 84 terminates just short of the aperture 83C, and is arranged to communicate simultaneously with the apertures 83A and 83D. The passageway 84 in turn communicates with a vacuum conduit 86 which extends axially through the shaft 54 and terminates in an elbow pipe 88 which is coupled to a vacuum source.

In the position indicated in Figure 5, when the lifting plate 20 is raised and the springpin 30 is depressed by the lowermost blank in the magazine, the valve 72 is opened, thereby allowing the passageway 70 to communicate with the vacuum source via the passageway 74, the aperture 83A, the semi-circular passageway 84, the vacuum conduit 86 and the elbow pipe 88. The vacuum is maintained as the lifting plate 20 is retracted and the turret is rotated in the direction of arrow 92 to the crease forming position in which the female dieplate 18A is moved into alignment with the male creasing plate 24 of the press 22. It can clearly be seen in Figure 5 how, when in the position of the aperture 83D, the aperture 83A still communicates between the passageway 70 and the vacuum conduit 86.

The semi-circular passageway 84 terminates just short of the aperture 83C. As a result, the vacuum is broken with respect to any lifting plate when it reaches the lowest eject position illustrated at 92.

Ejection of the creased blank from the female dieplate 18D is assisted by the lowermost lifting plate 20 being in the extended position, as is shown at 93.

A pair of circular cam-plates 94 and 96 are fixed within the turret to opposite ends of the shaft 54. As is clear from Figure 5A, an oblate camchannel 98 is formed in the outer surface of each of the cam-plates. Four followers 100, 100A, 100B and 100C travel within the channel 98, and are coupled to the respective lifting plates 20, 20A, 20B and 20C by respective conrods 102, 102A, 102B and 102C. The circular cam-plate 94 has an identical arrangement of followers and con-rods, with corresponding followers 100A and 100C arranged to lift opposite ends of the lifting plate 20 and 20B in tandem.

The cam channel 98 is configured so that, as the turret rotates relative to the channel, the upper- and lowermost lifting plates 20 and 20B will always be extended when in the respective blank feed and blank eject positions, whilst the laterally positioned lifting plates 20A and 20C will be in the retracted respective crease forming and dormant positions, flush with their corresponding female dieplates.

Referring now to Figure 6, a turret drive mechanism 110 for driving the turret 12 is shown. A crank arm 112 is mounted to the end of the central shaft 54, and a crank lever 114 extends between a free end of the crank arm 112 and a crank plate 116. The crank plate 116 is mounted rotatably to a stub axle 118 which is carried on a bevelled gear wheel 120. The bevelled gear wheel 120 is in turn driven by a bevel gear 122 which is mounted to a drive shaft 124.

The opposite end of the drive shaft 124 is fitted with a gear wheel 126 which is driven by a toothed pulley belt (not indicated) via an intermediate gear 128. The belt is coupled to a toothed sprocket 130. The drive shaft 124 is similarly journalled to the turret housing 52 on a pair of tapered bearings 132 and a double bearing wheel 134.

The crank plate 116 carries a cam pin 136 which is arranged to travel within an elliptical channel 138 which is formed within a cam wheel 140. The crank plate 116 in turn drives the press 22 via a press drive mechanism. As is clear from Figure 7, a drive shaft 142 extends from the centre of the cam wheel 140 to the press 22. A cog 144 is mounted to the drive shaft 142, and is driven via a cog 146 mounted behind the bevelled gear wheel 120.

As can be seen in Figure 8, a further cog 148 is splined to the end of the drive shaft 142. The cog 148 drives a cog 150 which is carried on a stepped shaft 152. The stepped shaft 152 is in turn journalled to a mounting block 154 on a pair of bearings 156. As can be seen in Figure 9, the shaft 152 carries an eccentrically mounted cam rod 158 which is arranged to travel within a pair of cam slots 160 carried on the rams 26. It is clear

how rotation of the eccentric cam rod 158 via the drive shaft 122 will cause the rams to reciprocate.

Each ram 26 is fitted with an adjustable collar 162 which is arranged to tension or to detension a spring 164 housed at the head of each ram. By adjusting the collar 162 the extent of travel of each ram can be finely adjusted. An additional compression spring 166 is housed just forwardly of the slot 160 for providing compressive play in the rams.

It is clear from the above description how the press and turret drive mechanisms are mechanically interlinked. This ensures synchronicity of operation, in the ram extends and retracts at exactly the right moment.

An advantage of the creasing unit of the invention is that it can be readily fitted to the Molins HLP machine without major modifications being required. In addition, the corner creases can now be formed in situ, thereby avoiding the disadvantages of separate creasing operations.

Claims

1. A creasing unit (10) for creasing a blank (28) for a box, characterized in that the creasing unit comprises:
   a) a carriage (12) carrying a first crease-forming die (18A);
   b) feed means (20) for feeding a blank onto the crease-forming die;
   c) retention means (32) for holding the blank in position on the crease forming die;
   d) a complemental crease-forming die (24); and
   e) a press (22) for sandwiching the blank between the crease-forming die and the complemental crease-forming die so as to form a first creased blank (28A).

2. A creasing unit according to claim 1 characterized in that it includes drive means (110) for driving the carriage from a first blank receiving position for receiving the first blank (28A) from the feed means to a first crease forming position in which the first crease forming die (18A) and the complemental crease forming die (24) are brought into alignment with one another.

3. A creasing unit according to claim 2 characterized in that it includes ejection means (20) associated with the feed means, the carriage being movable to a first blank ejecting position in which the first creased blank (28A) is ejected onto a conveyor (17).

4. A creasing unit according to any one of the preceding claims characterized in that the creasing unit (10) is arranged to be interposed on a box forming machine between a magazine (14) for holding uncreased pre-cut blanks (28) and a blank bed conveyor (17) for conveying the creased blanks to a folding station.

5. A creasing unit according to claim 3 in which the carriage comprises a multi-sided turret (12), at least one side of the turret carrying a crease-forming die (18A), and the turret being rotatable by the drive means (110) from the first blank receiving position to the first crease forming position to the first blank ejecting position.

6. A creasing unit according to claim 5 characterized in that the turret (12) comprises a four-sided substantially square turret having, first, second, third and fourth sides (12A, 12B, 12C, 12D) carrying respective first, second, third and fourth crease forming dies (18A, 18B, 18C, 18D), feed means (20) for feeding first, second, third and fourth blanks (28A, 28B, 28C, 28D) onto the first, second, third and fourth crease forming dies, retention means (32) for holding the blanks in position on the crease forming dies, and ejection means (20) for ejecting the creased blanks; whereby each quarter rotation of the turret by the drive means (110) results in the first, second, third and fourth crease forming dies (18A, 18B, 18C, 18D) rotating sequentially through blank-receiving, crease-forming, blank-ejecting and idle positions.

7. A creasing unit according to any one of the preceding claims characterized in that feed means comprises a reciprocating lifting plate (20) which is movable between a retracted position in which it is substantially flush with the crease forming die and an extended position in which it is raised from the crease forming die towards a blank magazine (14).

8. A creasing unit according to claim 7 characterized in that the retaining means includes at least one suction inlet (32) formed in the lifting plate and communicating with a vacuum source via a suction passage (70, 74, 84, 86, 88) for sucking an exposed blank (28A) onto the lifting plate with the lifting plate (20) extended and to hold the blank in position on the crease-forming die (18A) on retraction of the lifting plate, and valve means (34,72) carried on the lifting plate and being actuable by contact with a lowermost blank (28A) in

the blank magazine for opening the suction passage.

9. A creasing unit according to either one of claims 5 or 6 characterized in that the complemental die is (24) carried on the press (22), which is in turn mounted on a reciprocal press drive mechanism (141), and the turret (12) is operated by a turret drive mechanism (110) which is mechanically linked (116) to the press drive mechanism so as to ensure synchronicity of operation between the turret and the press.

10. A method of forming a crease (40) in a blank (28) for a box characterized in that comprises the steps of:
a) moving a carriage (12) to a first blank-receiving position;
b) feeding a first blank (28A) onto a first crease-forming die (18A) supported on the carriage;
c) moving the carriage (12) to a first crease-forming position;
d) sandwiching the first blank (28A) between the first crease-forming die (18A) and a complemental crease-forming die (24), thereby to form a first creased blank (28A);
e) moving the carriage to a first blank-ejecting position; and
f) ejecting the first creased blank from the carriage.

11. A method according to claim 10 characterized in that includes the initial step of depositing a plurality of uncreased pre-cut blanks (28) into a magazine (14), and the final steps of sequentially ejecting the creased blanks onto a blank bed conveyor (17) and conveying the blanks to a folding station.

12. A method according to either one of claims 10 or 11 characterized in that it includes the steps of:
g) moving the carriage (12) to a second blank-receiving position;
h) feeding a second blank (28B) onto a second crease-forming die (18B) supported on the carriage;
i) moving the carriage to a second crease-forming position;
j) sandwiching the second blank (28B) between the second crease-forming die and the complemental crease-forming die, thereby to from a second creased blank (28B);
k) moving the carriage to a second blank-ejecting position; and
l) ejecting the second creased blank (28B) from the carriage.

13. A method according to claim 12 characterized in that the second blank-receiving position corresponds to the first crease-forming position, and the second crease-forming position corresponds to the first blank-ejecting position.

14. A method according to either one of the preceding claims characterized in that it includes the step of moving the carriage to a first idle position (12B), the first idle position corresponding to the second blank-ejecting position.

15. A method according to any one of the preceding claims 12 to 14 characterized in that it includes the steps of:
m) moving the carriage to a third blank-receiving position;
n) feeding a third blank (28C) onto a third crease-forming die (18C) supported on the carriage;
o) moving the carriage (12) to a third crease-forming position;
p) sandwiching the third blank (28C) between the third crease-forming die (18C) and the complemental crease-forming die thereby to form a third creased blank (28C);
q) moving the carriage to a third blank-ejecting position; and
r) ejecting the third creased blank (28C) from the carriage.

16. A method according to claim 15 characterized in that the third blank- receiving position corresponds to the first blank-ejecting position and the second crease-forming position, and the third crease-forming position corresponds to the second blank-ejecting position.

17. A method according to either one of the preceding claims characterized in that it includes the steps of:
s) moving the carriage to a fourth blank-receiving position;
t) feeding a fourth blank (28D) onto a fourth crease-forming die (18D) supported on the carriage;
u) moving the carriage to a fourth crease-forming position;
v) sandwiching the fourth blank (28D) between the fourth crease-forming die (18D) and the complemental crease-forming die (24) thereby to form a fourth creased blank;
w) moving the carriage to a fourth blank-ejecting position; and
x) ejecting the fourth creased blank from the carriage.

18. A method according to claim 17 characterized in that the fourth blank-receiving position corresponds to the third crease-forming position, the fourth crease forming position corresponds to the third blank-ejecting position and the first blank-receiving position, and the fourth blank-ejecting position corresponds to the second blank- receiving position and the first crease-forming position.

19. A method according to either one of the preceding claims characterized in that the carriage is a four-sided turret (12A, 12B, 12C, 12D) which is quarter-rotated (13) through its various positions.

FIG 1A

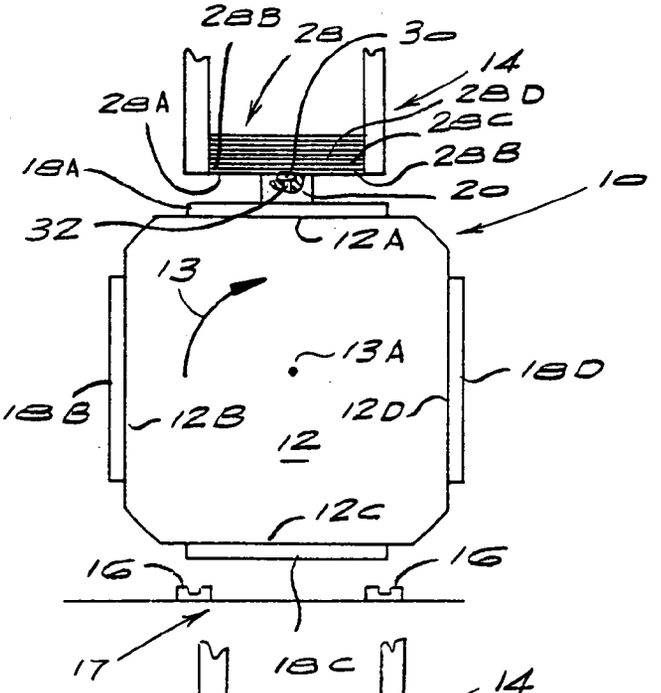


FIG 1B

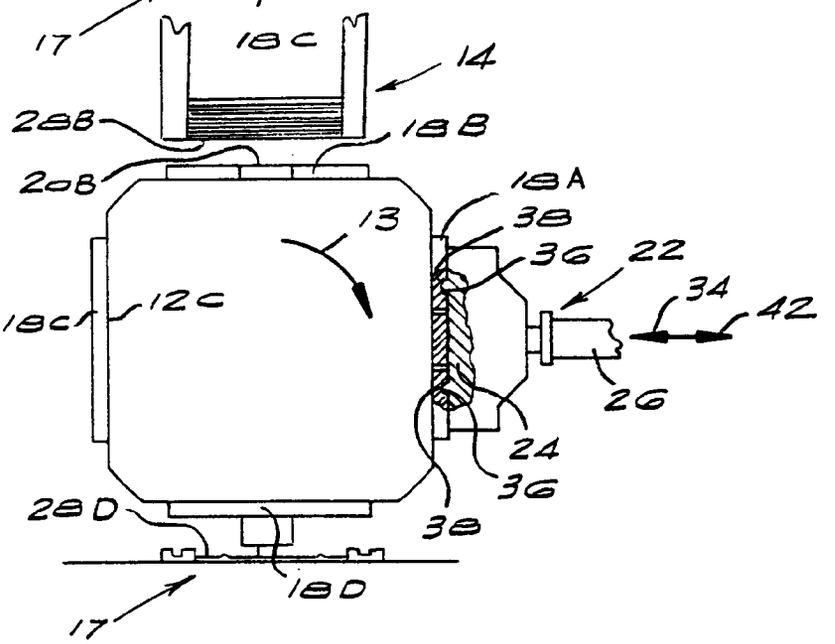


FIG 1C

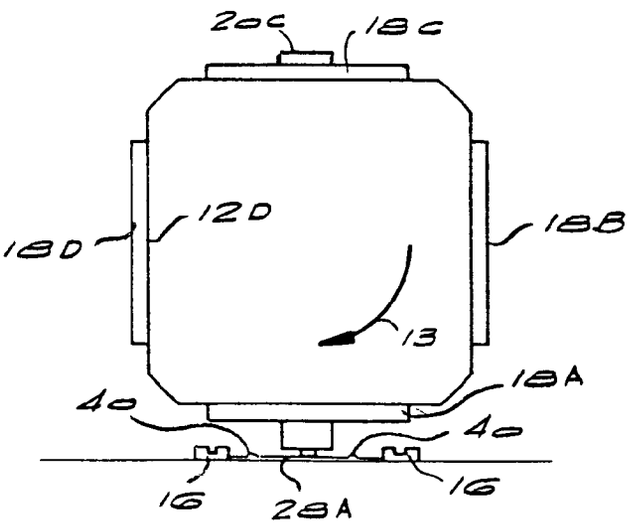


FIG 2

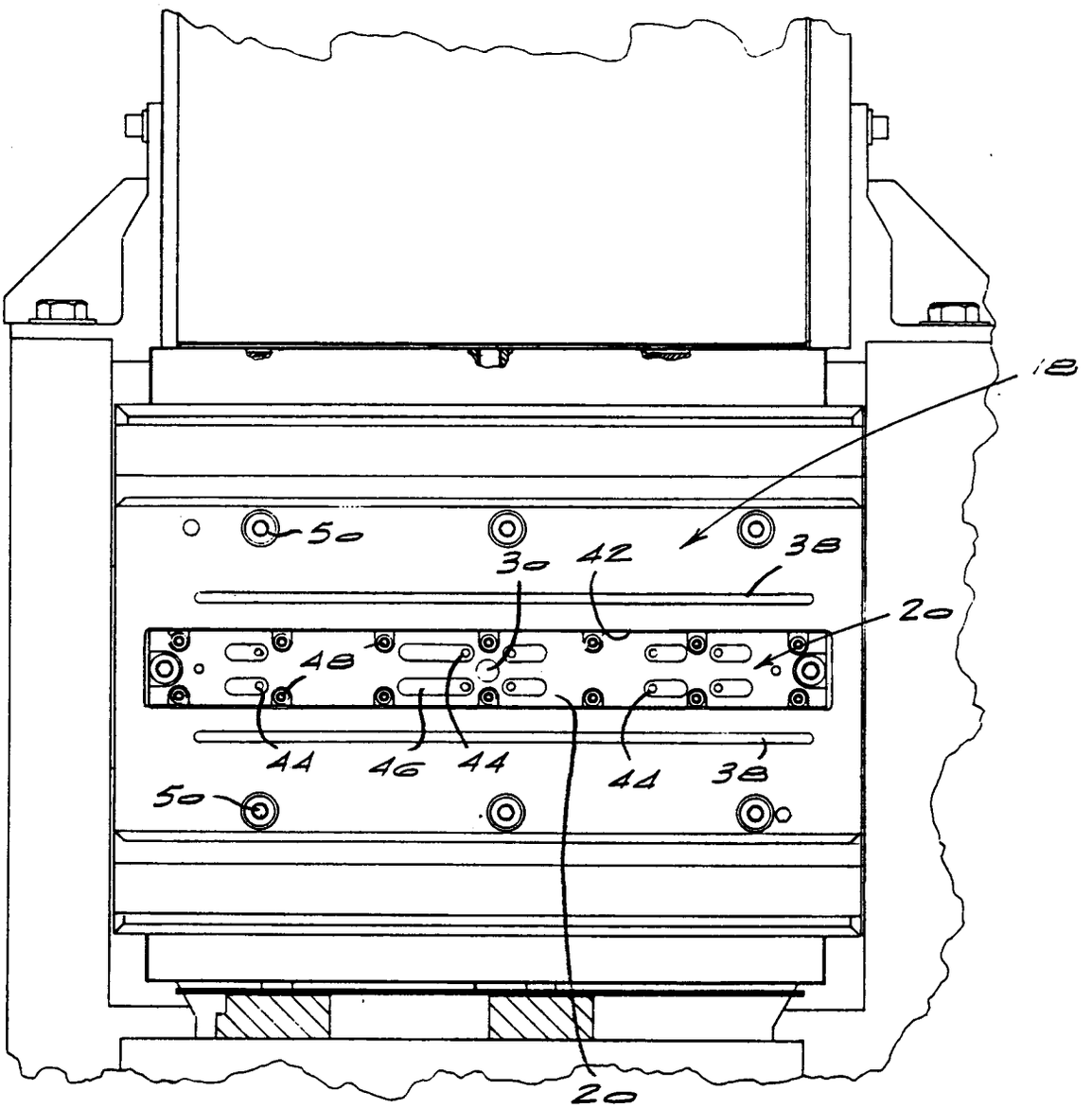
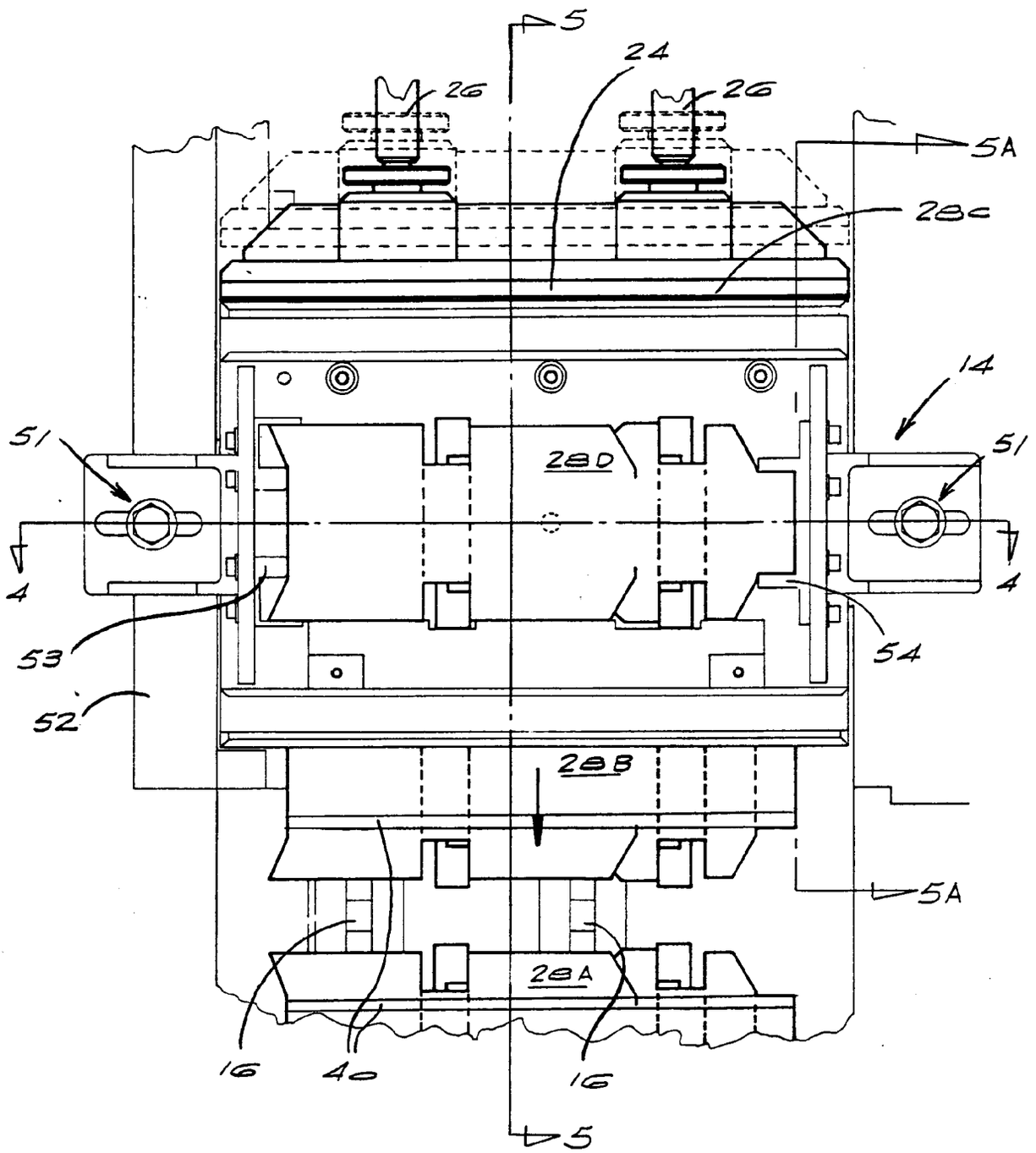
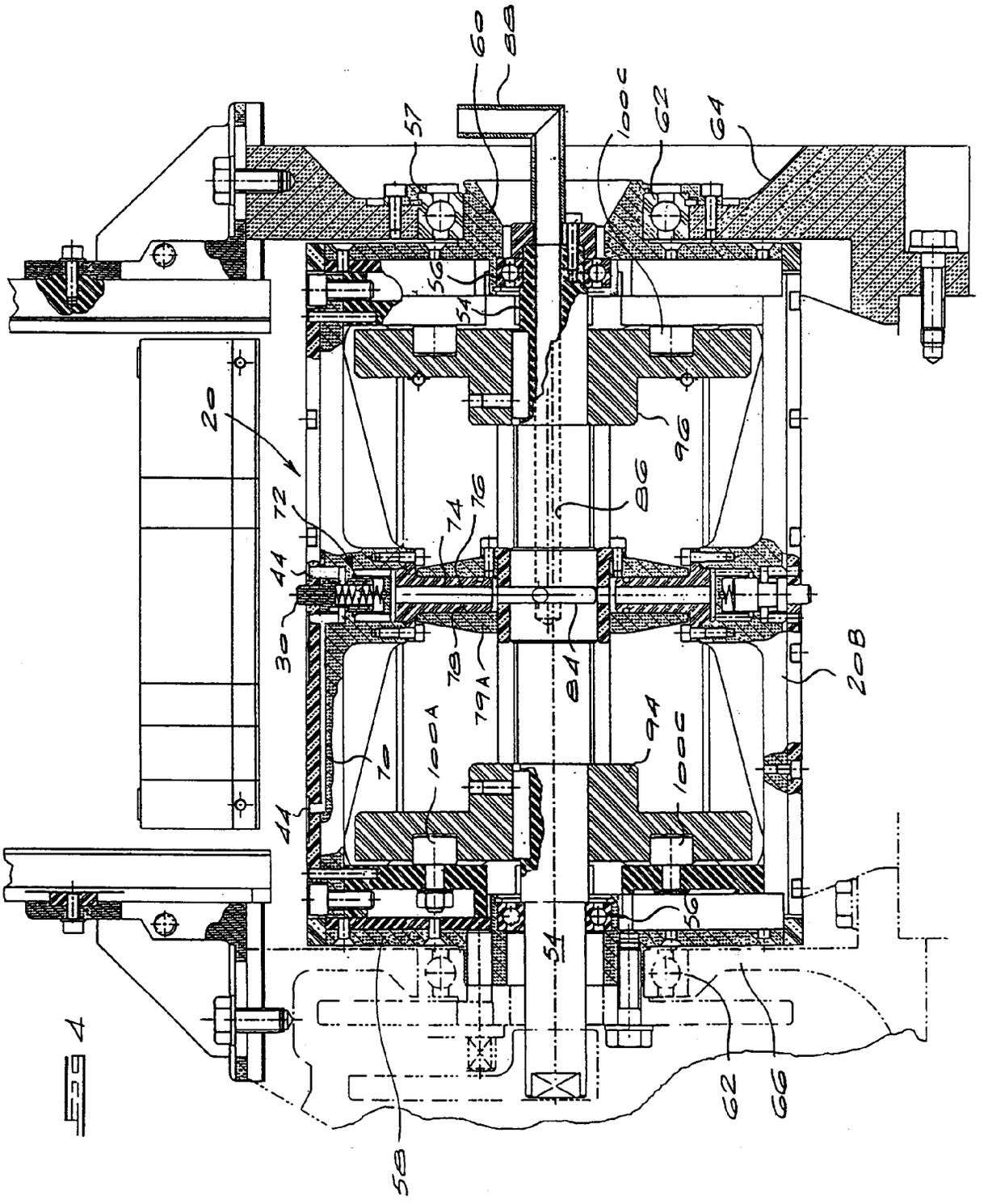


FIG 3

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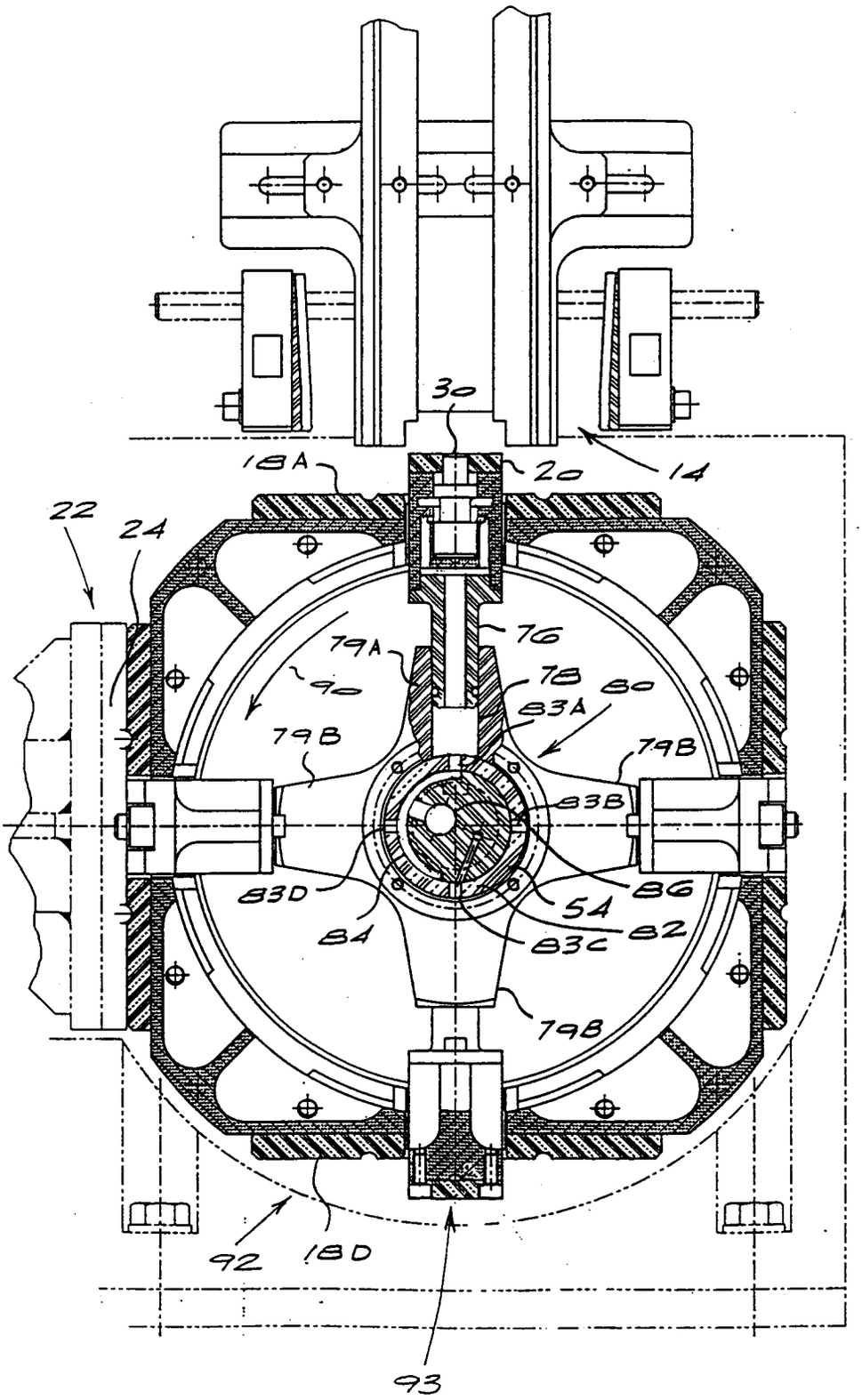
57
100c
62
64
56
54
20
96
86
72
74
76
44
30
78
79A
84
208
70
100A
94
100c
44
56
54
62
66
58

Fig. 4

FIG 5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18A
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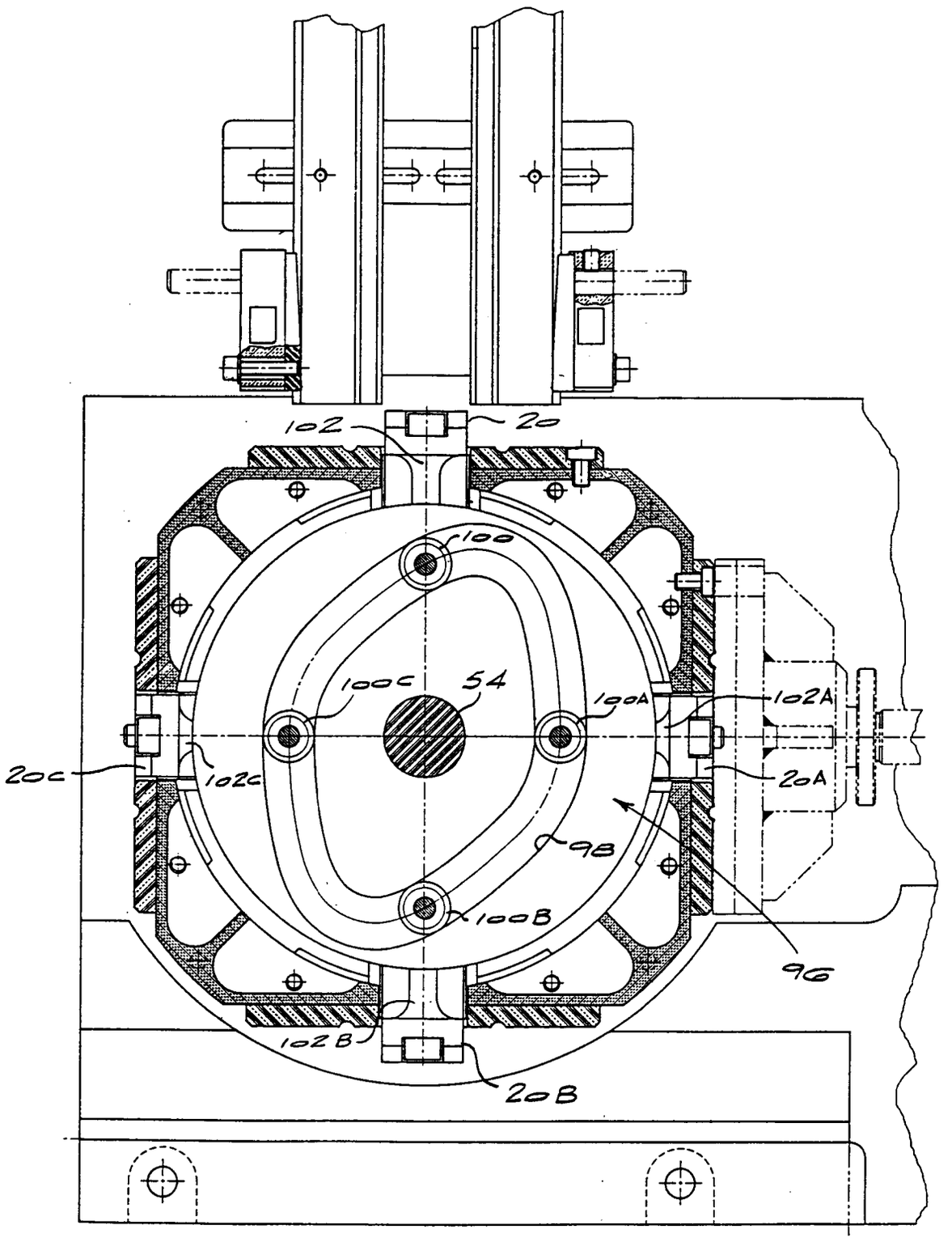
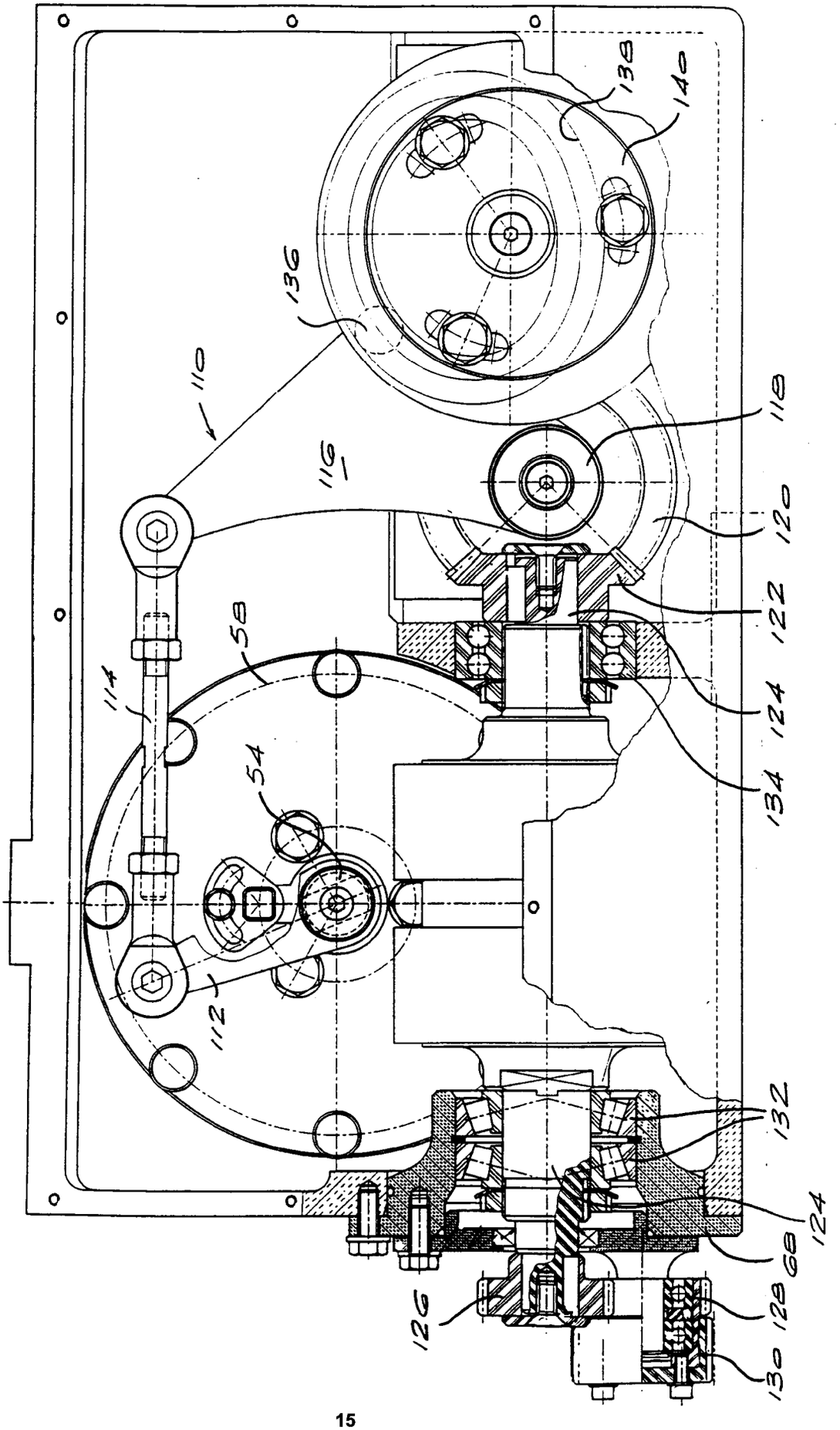
14
22
24
76
79A
90
78
80
83A
79B
79B
83B
83D
86
54
84
82
83C
79B
92
18D
93

FIG 5A




138
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54
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68
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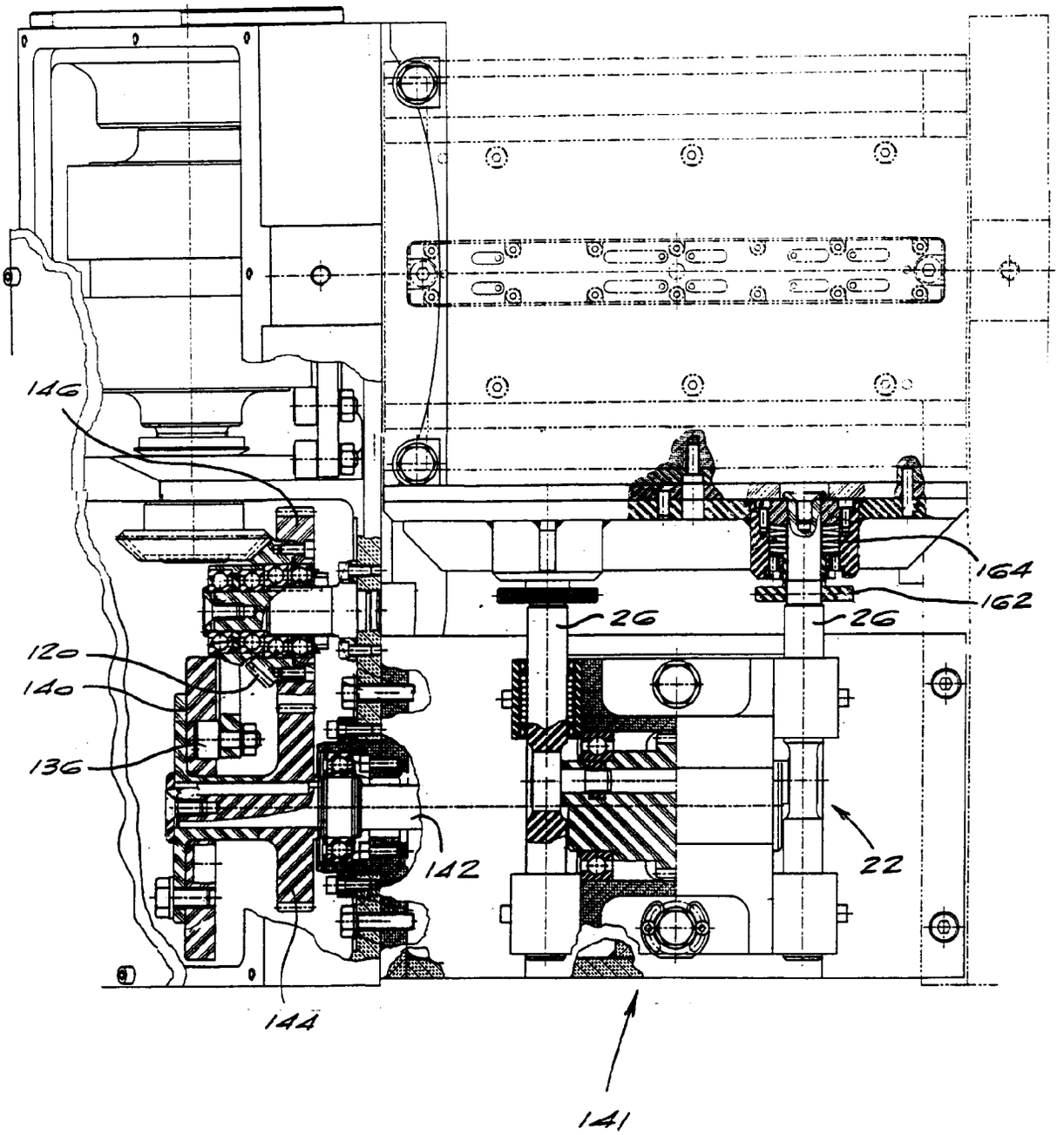
128
130

FIG 6

Fig 7



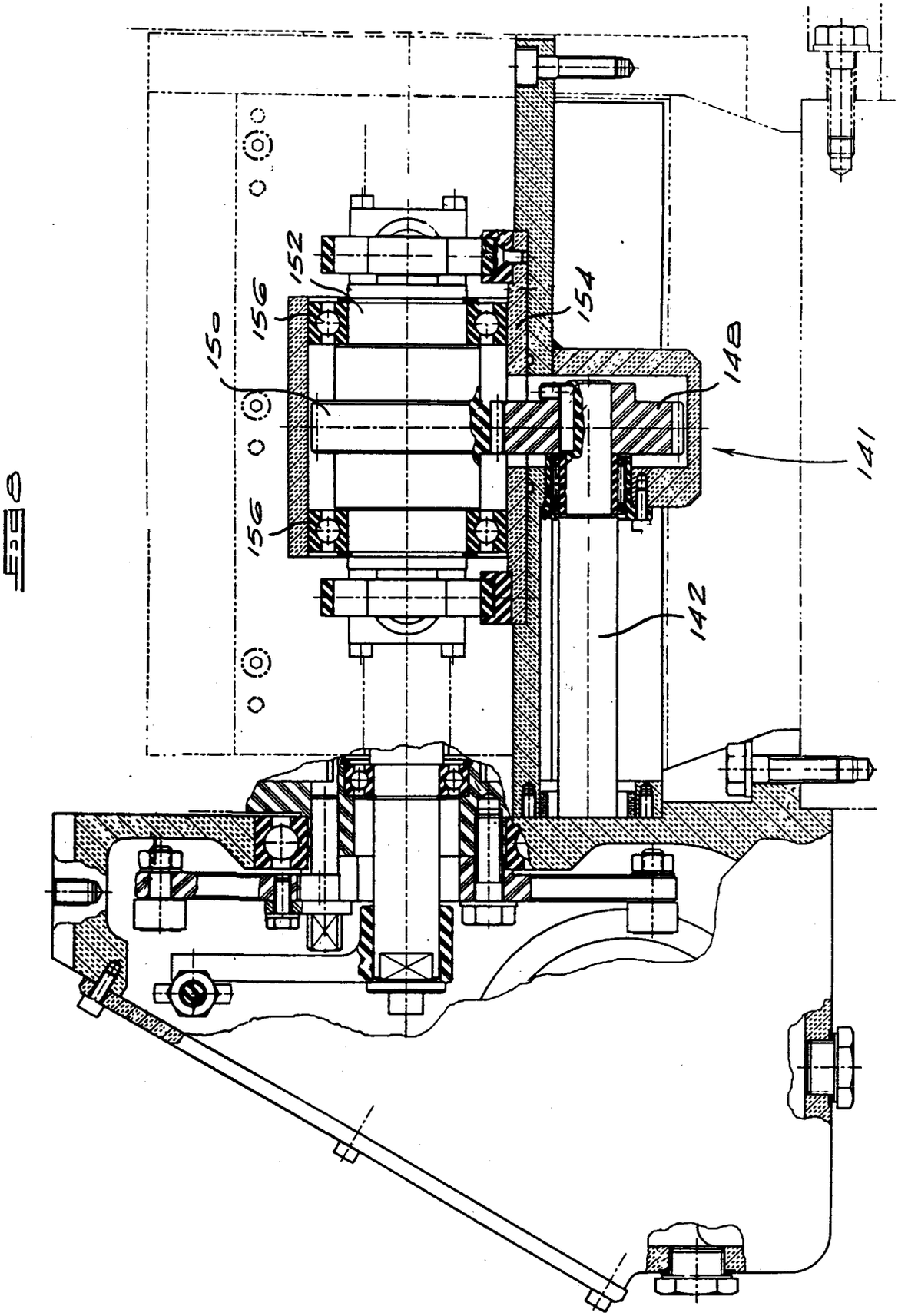


FIG 8

FIG 6