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(54) Creasing unit

Vorrichtung zum Faltenbilden

Dispositif pour rainer

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Description

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.

US-A-4,674,998 to Benedicenti discloses a forming assembly for forming boxes from semi-finished flat blanks. The machine includes a carriage moveable between blank-receiving, box forming and box ejecting positions, and includes feed means for feeding a blank onto the carriage, and retention means in the form of suction members for holding the blank in position on the carriage The blanks are pre-creased, with the forming station solely forming a box-forming function, and not being used in any creasing role.

US-A-3,768,950 to Ihde discloses an apparatus for scoring synthetic plastic sheet material. The apparatus comprises a female die member having a slot corresponding to a desired score line, and a male scoring member including a scoring rule moveable against the sheet material to stretch it into the slot. A resilient material frictionally engages the plastic sheet to immobilise it between the members in those areas bordering the slot during score forming. The resilient material extends along opposite sides of the rule and above its operable end, and is typically of sufficient dimension to extend into the slot to compress the sheet material between the bottom of the slot and the end of the scoring rule. This apparatus provides for a once-off operation rather than for the continuous scoring of sheets in a production line-type process.

SUMMARY OF THE INVENTION

According to the invention there is provided a creasing unit for creasing a blank for a box as defined in claim 1.

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 as defined in claim 11.

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 38 which are semi-circular in cross section. The male creasing plate 24 is similarly provided with a complemental pair of semi-circular ridges 36 which form a snug fit within the female channels 38 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 18B 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 maga-

zine 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, comprising a carriage (12) movable between blank-receiving, forming and ejecting positions, and including feed means (14,20) for feeding a first blank (28A) onto the carriage (12), and retention means (32) for holding the first blank (28A) in position on the carriage (12), characterized in that:

   a) the carriage (12) carries a first crease-forming die (18A) within which at least one crease-forming profile (38) is defined;

   b) the feed means (14,20) are arranged to feed the first blank (28A) onto the crease-forming die (18A);

   c) the retention means (32) are arranged to hold the first blank in position on the crease forming die;

   d) a complemental crease-forming die (24) carries at least one corresponding crease-forming profile (36) which is co-operable with the crease-forming profile (38);

   e) a press (22) is provided for sandwiching the first blank between the crease-forming die and the complemental crease-forming die so as to form a first creased blank (28A); and

   f) ejection means (20) are provided for ejecting the first blank (28A), the carriage (12) being movable to a first blank ejecting position in which the first creased blank (28A) is ejected by the ejection means (20).

2. A creasing unit according to claim 1 characterized in that it includes drive means (110) for driving the carriage (12) from the first blank receiving position for receiving the first blank (28A) from the feed means (14,20) 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, and from the crease forming position to the first blank ejecting position.

3. A creasing unit according to either one of the preceding claims characterized in that the ejection means (20) forms part of the feed means carried on the carriage (12).

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 2 in which the carriage comprises a multi-sided turret (12), at least one side of the turret carrying the 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 the feed means (14,20) comprises a magazine (14) and 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 retention means (32) 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 a lowermost exposed blank (28A) in the magazine (14) 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 (24) is 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 creasing unit according to any one of the preceding claims characterized in that the crease-forming profile (38) is a pair of channels and the corresponding crease-forming profile (36) is a complemental pair of ridges (36).

11. A method of forming a crease (40) in a blank (28) for a box comprising the steps of:

a) moving a carriage (12) to a first blank-receiving position;

b) feeding a first blank (28A) onto the carriage (12);

c) moving the carriage (12) to a first forming position; and

d) moving the carriage (12) to an ejecting position;
characterized in that in step b) the first blank (28A) is fed onto a first crease-forming die (18A) supported on the carriage (12) and defining at least one crease-forming profile (38), and in that it includes the further steps, after step c), of:

e) utilizing a press (22) for sandwiching the first blank (28A) between the first crease-forming die (18A) and a complemental crease-forming die (24) carrying at least one corresponding crease-forming profile (36) which is co-operable with the crease-forming profile (38), thereby to form a first creased blank (28A), and after step d), of;

f) ejecting the first creased blank (28A) from the carriage (12) after it has been moved to the ejecting position.

12. A method according to claim 11 characterized in that it 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.

13. A method according to either one of claims 11 or 12 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 (12);

i) moving the carriage (12) 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 form a second creased blank (28B);

k) moving the carriage (12) to a second blank-ejecting position; and

l) ejecting the second creased blank (28B) from the carriage.

14. A method according to claim 13 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.

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

16. A method according to any one of the preceding claims 13 to 15 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.

17. A method according to claim 16 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.

18. 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.

19. A method according to claim 18 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.

20. 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.

Patentansprüche

1. Eine Falteinheit (10) zum Falten eines Rohlings (28) für eine Schachtel, enthaltend einen Wagen (12), der zwischen der Rohlingaufnahme-, -bildungs- und -auswurfstellung bewegbar ist, einschließlich Vorschubmittel (14, 20) zum Vorschieben eines ersten Rohlings (28A) auf den Wagen (12), sowie Haltemittel (32) zum Halten des ersten Rohlings (28A) in Position auf dem Wagen (12), dadurch gekennzeichnet,

a) daß der Wagen (12) einen ersten Faltformstempel (18A) aufweist, innerhalb dessen mindestens ein Faltformprofil (38) definiert ist;

b) daß die Vorschubmittel (14, 20) so angeordnet sind, daß sie den ersten Rohling (28A) auf den Faltformstempel (18A) vorschieben;

c) daß die Haltemittel (32) so angeordnet sind, daß sie den ersten Rohling auf dem Faltformstempel in Position halten;

d) daß ein komplementärer Faltformstempel (24) mindestens ein entsprechendes Faltformprofil (36) aufweist, das mit dem Faltformprofil (38) zusammenwirkt;

e) daß eine Presse (22) zum Einspannen des ersten Rohlings zwischen dem Faltformstempel und dem komplementären Faltformstempel vorgesehen ist, um einen ersten gefalteten Rohling (28A) zu erzeugen; und

f) daß Auswurfmittel (20) zum Auswerfen des ersten Rohlings (28A) vorgesehen sind, wobei der Wagen (12) zu einer ersten Rohlingauswurfposition bewegbar ist, in der der erste gefaltete Rohling (28A) durch die Auswurfmittel (20) ausgeworfen wird.

2. Eine Falteinheit gemäß Anspruch 1, dadurch gekennzeichnet, daß sie Antriebsmittel (110) zum Antreiben des Wagens (12) aus der ersten Rohlingaufnahmeposition zur Aufnahme des ersten Rohlings (28A) aus den Vorschubmitteln (14, 20) in die erste Faltformposition, in der der erste Faltformstempel (18A) und der komplementäre Faltformstempel (24) miteinander ausgerichtet werden, und aus der Faltformposition in die erste Auswurfposition beinhaltet.

3. Eine Falteinheit gemäß einem beliebigen der vorstehenden Ansprüche, dadurch gekennzeichnet, daß das Auswurfmittel (20) Teil des auf dem Wagen (2) getragenen Vorschubmittels ist.

4. Eine Falteinheit gemäß einem beliebigen der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Falteinheit (10) so eingerichtet ist, daß sie auf einer Schachtelformmaschine zwischen einem Magazin (14) zum Halten der nichtgefalteten, vorgeschnittenen Rohlinge (28) und einem Rohlingbettförderer (17) zum Fördern der gefalteten Rohlinge zu einer Faltstation zwischengeschoben werden kann.

5. Eine Falteinheit gemäß Anspruch 2, in der der Wagen einen Vielseitenrevolverkopf (12) awfweist, wobei wenigstens eine Seite des Revolverkopfs den Faltformstempel (18A trägt, und der Revolverkopf durch Antriebsmittel (110) aus der ersten Rohlingaufnahmeposition zur ersten Faltformposition in die ersten Rohlingauswurfposition drehbar ist.

6. Eine Falteinheit gemäß Anspruch 5, dadurch gekennzeichnet, daß der Revolverkopf (12) ein vierseitiger, im wesentlichen quadratischer Revolverkopf ist, der eine erste, eine zweite, eine dritte und eine vierte Seite (12A, 12B, 12C, 12D) aufweist, auf der entsprechend erste, zweite, dritte und vierte Faltformstempel (18A, 18B. 18C, 18D), Vorschubmittel (20) zum Vorschieben eines ersten, zweiten, dritten und vierten Rohlings (28A, 28B, 20C, 28D) auf den ersten, zweiten, dritten und vierten Faltformstempel aufweist, Haltemittel (32) zum Halten der Rohlinge in Position auf den Faltformstempeln, und Auswurfmittel (20) zum Auswerfen der mit Falten versehenen Rohlinge vorgesehen sind; wobei jede Viertelumdrehung des Revolverkopfs durch die Antriebsmittel (110) dazu führt daß er erste, zweite, dritte und vierte Faltformstempel (18A, 18B, 18C, 18D) der Reihe nach durch die Positionen Rohlingaufnehmen, Faltformen, Rohlingauswerfen und Leerlaufstellung dreht.

7. Eine Falteinheit gemäß einem beliebigen der vorstehenden Ansprüche, dadurch gekennzeichnet, daß das Vorschubmittel (14, 20) ein Magazin (14) und eine hin- und hergehende Hebeplatte (20) beinhaltet, die zwischen einer eingezogenen Stellung, in der sie im wesentlichen plan mit dem Faltformstempel ist, und einer ausgeschobenen Position, in der sie von dem Faltformstempel zu einem Rohlingmagazin (14) gehoben wird, bewegbar ist.

8. Eine Falteinheit gemäß Anspruch 7, dadurch gekennzeichnet, daß das Haltemittel (32) mindestens einen Anzaugeingang (32) aufweist, der in der Hebeplatte ausgebildet ist und mit einer Vakuumquelle über eine Ansaugleitung (70, 74, 84, 86, 88) in Verbindung steht zum Ansaugen eines untersten freiliegenden Rohlings (28A) im Magazin (14) auf die Hebeplatte, wobei die Hebeplatte (20) ausgefahren ist, und um den Rohling beim Zurückfahren der Hebeplatte in Position auf dem Faltformstempel (18A) zu halten, und Ventilmittel (34, 72) auf der Hebeplatte getragen werden und durch Kontakt mit einem untersten Rohling (28A) im Rohlingmagazin zum Öffnen der Ansaugleitung aktiviert werden.

9. Eine Falteinheit gemäß einem beliebigen der Ansprüche 5 oder 6, dadurch gekennzeichnet, daß der komplementäre Stempel (24) auf der Presse (22) getragen wird, die ihrerseits auf einem hin- und herfahrenden Pressenmechanismus (141) montiert ist, und der Revolverkopf (12) von einem Revolverkopfmechanismus (110) betätigt wird, der mechanisch so mit dem Pressenmechanismus verbunden (116) ist, daß der Synchronismus des Betriebs zwischen Revolverkopf und Presse sichergestellt ist.

10. Eine Falteinheit gemäß einem beliebigen der vorstehenden Ansprüche, dadurch gekennzeichnet, daß das Faltformprofil (38) ein Kanalpaar ist und das entsprechende Faltformprofil (36) ein komplementäres Rippenpaar (36) ist.

11. Ein Verfahren zum Ausbilden einer Falte (40) in einem Rohling (28) für eine Schachtel, beinhaltend die folgenden Schritte:

a) Fahren eines Wagens (12) in eine erste Rohlingaufnahmeposition;

b) Vorschieben eines ersten Rohlings (28A) auf den Wagen (12);

c) Fahren des Wagens (12) in eine erste Formposition; und

d) Fahren des Wagens (12) in eine Auswurfposition;
dadurch gekennzeichnet, daß in Schritt b) der erste Rohling (28A) auf einen ersten Faltformstempel (18A) geschoben wird, der auf dem Wagen (12) gehaltert wird, und Definieren wenigstens eines Faltformprofils (38), und daß es nach Schritt c) die folgenden weiteren Schritte umfaßt:

e) Benutzen einer Presse (22) zum Einspannen des ersten Rohlings (28A) zwischen dem ersten Faltformstempel (18A) und einen komplementären Faltformstempel (24), der wenigstens ein entsprechendes Faltformprofil (36) trägt, das mit dem Faltformprofil (38) zusammen betreibbar ist, um so einen ersten gefalteten Rohling (28A) zu formen, und nach Schritt d),

f) Auswerfen des ersten gefalteten Rohlings (28A) aus dem Wagen (12), nachdem dieser in die Auswurfposition gefahren wurde.

12. Ein Verfahren gemäß Anspruch 11, dadurch gekennzeichnet, daß es den Anfangsschritt der Ablage einer Vielzahl nichtgefalteter, vorgeschnittener Rohlinge (28) in ein Magazin (14), und die Endschritte des sequentiellen Auswerfens der gefalteten Rohlinge auf einen Rohlingbettförderer (17) und Befördern der Rohlinge zu einer Faltstation umfaßt.

13. Ein Verfahren gemäß Anspruch 11 oder 12, dadurch gekennzeichnet, daß es die folgenden Schritte umfaßt:

g) Fahren des Wagens (12) in eine zweite Rohlingaufnahmeposition;

h) Vorschieben eines zweiten Rohlings (28B) auf einen zweiten Faltformstempel (18B), der auf dem Wagen (12) gehaltert ist;

i) Fahren des Wagens (12) in eine zweite Faltformposition;

j) Einspannen des zweiten Rohlings (28B) zwischen dem zweiten Faltformstempel und dem komplementären Faltformstempel, und auf diese Weise Formen eines zweiten gefalteten Rohlings (28B);

k) Fahren des Wagens (12) in eine zweite Auswurfposition; und

l) Auswerfen des zweiten gefalteten Rohlings (28B) vom Wagen.

14. Ein Verfahren gemäß Anspruch 13, dadurch gekennzeichnet, daß die zweite Rohlingaufnahmeposition der ersten Faltformposition, und die zweite Faltformposition der ersten Rohlingauswurfposition entspricht.

15. Ein Verfahren gemäß einem beliebigen der vorstehenden Ansprüche, dadurch gekennzeichnet, daß es den Schritt des Fahrens des Wagens (12) zu einer ersten Leerlaufstellung (12) beinhaltet, wobei die erste Leerlaufstellung der zweiten Rohlingauswurfposition entspricht.

16. Ein Verfahren gemäß einem beliebigen der vorstehenden Ansprüche 13 bis 15, dadurch gekennzeichnet, daß es die folgenden Schritte umfaßt:

m) Fahren des Wagens in eine dritte Rohlingaufnahmeposition;

n) Vorschieben eines dritten Rohlings (28C) auf einen dritten Faltformstempel (18C), der auf dem Wagen gehaltert ist;

o) Fahren des Wagens (12) in eine dritte Faltformposition;

p) Einspannen des dritten Rohlings (28C) zwischen dem dritten Faltformstempel (18C) und dem komplementären Faltformstempel, und auf diese Weise Formen eines dritten gefalteten Rohlings (28C);

q) Fahren des Wagens in eine dritte Auswurfposition; und

r) Auswerfen des dritten gefalteten Rohlings (28C) vom Wagen.

17. Ein Verfahren gemäß Anspruch 16, dadurch gekennzeichnet, daß die dritte Rohlingaufnahmeposition dar ersten Rohlingauswurfposition und der zweiten Faltformposition, und die dritte Faltformposition der zweiten Rohlingauswurfposition entspricht.

18. Ein Verfahren gemäß eine beliebigen der vorstehenden Ansprüche, dadurch gekennzeichnet, daß es die folgenden Schritte umfaßt:

s) Fahren des Wagens in eine vierte Rohlingaufnahmeposition;

t) Vorschieben einem vierten Rohlings (28D) auf einen vierten Faltformstempel (18D), der auf dem Wagen gehaltert ist;

u) Fahren das Wagens in eine vierte Faltformposition;

v) Einspannen des vierten Rohlings (28D) zwischen dem dritten Faltformstempel (18D) und dem komplementären Faltformstempel (24), und auf diese Weise Formen eines vierten gefalteten Rohlings;

w) Fahren des Wagens in eine vierte Auswurfposition; und

x) Auswerfen des vierten gefalteten Rohlings vom Wagen.

19. Ein Verfahren gemäß Anspruch 18, dadurch gekennzeichnet, daß die vierte Rohlingaufnahmeposition der dritten Faltformposition, die vierte Faltformposition der dritten Rohlingauswurfposition und der ersten Rohlingaufnahmeposition, und die vierte Rohlingauswurfposition der zweiten Rohling-

aufnahmeposition und der ersten Faltformposition entspricht.

20. Ein Verfahren gemäß einem beliebigen der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Wagen ein vierseitiger Revolverkopf (12A, 12B, 12C, 12D) ist, der jeweils in Viertelumdrehungen (13) durch seine verschiedenen Positionen gedreht wird.

Revendications

1. Unité de froncement (10) pour froncer une ébauche (28) pour une boîte, comprenant un chariot (12) mobile entre des positions de réception, de formation et d'éjection d'ébauche, et comprenant des moyens de délivrance (14, 20) pour délivrer une première ébauche (28A) sur le chariot (12), et des moyens de rétention (32) pour maintenir la première ébauche (28A) en position sur le chariot (12), caractérisée en ce que :

a) le chariot (12) porte une première matrice de formation de fronce (18A) à l'intérieur de laquelle au moins un profil de formation de fronce (38) est défini ;
b) les moyens de délivrance (14, 20) sont agencés de façon à délivrer la première ébauche (28A) sur la matrice de formation de fronce (18A) ;
c) les moyens de rétention (32) sont agencés pour maintenir la première ébauche en position sur la matrice de formation de fronce ;
d) une matrice de formation de fronce complémentaire (24) porte au moins un profil de formation de fronce correspondant (36) qui peut coopérer avec le profil de formation de fronce (38) ;
e) une presse (22) est présente pour prendre en sandwich la première ébauche entre la matrice de formation de fronce et la matrice de formation de fronce complémentaire de façon à former une première ébauche froncée (28A) ; et
f) des moyens d'éjection (20) sont présents pour éjecter la première ébauche (28A), le chariot (12) étant mobile vers une position d'éjection de première ébauche dans laquelle la première ébauche froncée (28A) est éjectée par les moyens d'éjection (20).

2. Unité de froncement selon la revendication 1, caractérisée en ce qu'elle comprend des moyens d'entraînement (110) pour entraîner le chariot (12) de la position de réception de première ébauche pour recevoir la première ébauche (28A) des moyens de délivrance (14, 20) à une première position de formation de fronce dans laquelle la première matrice de formation de fronce (18A) et la matrice de formation de fronce complémentaire (24) sont mises en alignement l'une avec l'autre, et de la position de formation de fronce à la position d'éjection de première ébauche.

3. Unité de froncement selon l'une ou l'autre des revendications précédentes, caractérisée en ce que les moyens d'éjection (20) font partie des moyens de délivrance portés sur le chariot (12).

4. Unité de froncement selon l'une quelconque des revendications précédentes, caractérisée en ce que l'unité de froncement (10) est agencée de façon à être interposée sur une machine de formation de boîtes entre un magasin (14) pour maintenir des ébauches prédécoupées non froncées (28) et un convoyeur à berceaux d'ébauches (17) pour convoyer les ébauches froncées vers un poste de pliage.

5. Unité de froncement selon la revendication 2, dans laquelle le chariot comprend une tourelle à côtés multiples (12), au moins un côté de la tourelle portant la matrice de formation de fronce (18A), et la tourelle pouvant tourner sous l'actionnement des moyens d'entraînement (110), de la position de réception de première ébauche à la première position de formation de fronce et à la position d'éjection de première ébauche.

6. Unité de froncement selon la revendication 5, caractérisée en ce que la tourelle (12) comprend une tourelle sensiblement carrée à quatre côtés comportant des premier, deuxième, troisième et quatrième côtés (12A, 12B, 12C, 12D), portant des première, deuxième, troisième et quatrième matrices de formation de fronce (18A, 18B, 18C, 18D) respectives, des moyens de délivrance (20) pour délivrer des première, deuxième, troisième et quatrième ébauches (28A, 28B, 28C, 28D) sur les première, deuxième, troisième et quatrième matrices de formation de fronce, des moyens de rétention (32) pour maintenir les ébauches en position sur les matrices de formation de fronce, des moyens d'éjection (20) pour éjecter les ébauches froncées ; grâce à quoi chaque quart de rotation de la tourelle sous l'actionnement des moyens d'entraînement (110) produit la rotation séquentielle des première, deuxième, troisième et quatrième matrices de formation de fronce (18A, 18B, 18C, 18D) en passant par les positions de réception d'ébauche, de formation de fronce, d'éjection d'ébauche et de repos.

7. Unité de froncement selon l'une quelconque des revendications précédentes, caractérisée en ce que les moyens de délivrance (14, 20) comprennent un magasin (14) et une plaque de soulève-

ment à mouvement de va-et-vient (20) qui est mobile entre une position rétractée dans laquelle elle est sensiblement à niveau avec la matrice de formation de fronce et une position étendue dans laquelle elle est élevée au-dessus de la matrice de formation de fronce en direction d'un magasin d'ébauches (14).

8. Unité de froncement selon la revendication 7, caractérisée en ce que les moyens de rétention (32) comprennent au moins une entrée d'aspiration (32) formée dans la plaque de soulèvement et communiquant avec une source de vide par l'intermédiaire d'un passage d'aspiration (70, 74, 84, 86, 88) pour aspirer une ébauche exposée la plus basse (28A) dans le magasin (14) sur la plaque de soulèvement avec la plaque de soulèvement (20) étendue et pour maintenir l'ébauche en position sur la matrice de formation de fronce (18A) lors de la rétractation de la plaque de soulèvement et des moyens formant vanne (34, 72) portés sur la plaque de soulèvement et pouvant être actionnés par contact avec une ébauche située le plus bas (28A) dans le magasin d'ébauches pour ouvrir le passage d'aspiration.

9. Unité de froncement selon l'une ou l'autre des revendications 5 ou 6, caractérisée en ce que la matrice complémentaire (24) est portée sur la presse (22), qui est elle-même montée sur un mécanisme d'entraînement de presse à mouvement de va-et-vient (141), et en ce que la tourelle est actionnée par un mécanisme d'entraînement de tourelle (110) qui est mécaniquement relié (116) au mécanisme d'entraînement de presse de façon à assurer le synchronisme de fonctionnement entre la tourelle et la presse.

10. Unité de froncement selon l'une quelconque des revendications précédentes, caractérisée en ce que le profil de formation de fronce (38) est une paire de canaux et en ce que le profil de formation de fronce correspondant (36) est une paire complémentaire de nervures (36).

11. Procédé de formation d'un froncement (40) dans une ébauche (28) pour une boîte, comprenant les étapes consistant à :

a) déplacer un chariot (12) vers une position de réception de première ébauche ;
b) délivrer une première ébauche (28A) sur le chariot (12) ;
c) déplacer le chariot (12) dans une première position de formation ; et
d) déplacer le chariot (12) dans une position d'éjection ;

caractérisé en ce que, dans l'étape b), la première ébauche (28A) est délivrée sur une première matrice de formation de fronce (18A) supportée sur le chariot (12), et définissant au moins un profil de formation de fronce (38) et en qu'il comprend les étapes additionnelles, après l'étape c), consistant à :

e) utiliser une presse (22) pour prendre en sandwich la première ébauche (28A) entre la première matrice de formation de fronce (18A) et une matrice de formation de fronce complémentaire (24) portant au moins un profil de formation de fronce correspondant (36) qui peut coopérer avec le profil de formation de fronce (38), de façon à former par conséquent une première ébauche froncée (28A), et, après l'étape d), consistant à :
f) éjecter la première ébauche froncée (28A) du chariot (12) après qu'il ait été déplacé dans la position d'éjection.

12. Procédé selon la revendication 1, caractérisé en ce qu'il comprend l'étape initiale de dépôt d'une pluralité d'ébauches prédécoupées non froncées (28) dans un magasin (14), et les étapes finales d'éjection séquentielle des ébauches froncées sur un convoyeur à berceaux d'ébauches (17), et de convoyage des ébauches dans un poste de pliage.

13. Procédé selon l'une ou l'autre des revendications 11 ou 12, caractérisé en ce qu'il comprend les étapes consistant à :

g) déplacer le chariot (12) dans une position de réception de deuxième ébauche ;
h) délivrer une deuxième ébauche (28B) sur une deuxième matrice de formation de fronce (18B) supportée sur le chariot (12) ;
i) déplacer le chariot (12) dans une deuxième position de formation de fronce ;
j) prendre en sandwich la deuxième ébauche (28B) entre la deuxième matrice de formation de fronce et la matrice de formation de fronce complémentaire, de façon à former par conséquent une deuxième ébauche froncée (28B) ;
k) déplacer le chariot (12) dans une position d'éjection de deuxième ébauche ; et
l) éjecter la deuxième ébauche froncée (28B) du chariot.

14. Procédé selon la revendication 13, caractérisé en ce que la position de réception de deuxième ébauche correspond à la première position de formation de fronce et en ce que la deuxième position de formation de fronce correspond à la position d'éjection de première ébauche.

15. Procédé selon l'une quelconque des revendications précédentes, caractérisé en ce qu'il comprend

l'étape de déplacement du chariot (12) dans une première position de repos (12B), la première position de repos correspondant à la position d'éjection de deuxième ébauche.

16. Procédé selon l'une quelconque des revendications précédentes 13 à 15, caractérisé en ce qu'il comprend les étapes consistant à :

m) déplacer le chariot dans une position de réception de troisième ébauche ;
n) délivrer une troisième ébauche (28C) sur une troisième matrice de formation de fronce (18C) supportée sur le chariot ;
o) déplacer le chariot (12) dans une troisième position de formation de fronce ;
p) prendre en sandwich la troisième ébauche (28C) entre la troisième matrice de formation de fronce (18C) et la matrice de formation de fronce complémentaire, de façon à former par conséquent une troisième ébauche froncée (28C) ;
q) déplacer le chariot dans une position d'éjection de troisième ébauche ; et
r) éjecter la troisième ébauche froncée (28C) du chariot.

17. Procédé selon la revendication 16, caractérisé en ce que la position de réception de troisième ébauche correspond à la position d'éjection de première ébauche et à la deuxième position de formation de fronce, et en ce que la troisième position de formation de fronce correspond à la position d'éjection de deuxième ébauche.

18. Procédé selon l'une quelconque des revendications précédentes, caractérisé en ce qu'il comprend les étapes consistant à :

s) déplacer le chariot dans une position de réception de quatrième ébauche ;
t) délivrer une quatrième ébauche (28D) sur une quatrième matrice de formation de fronce (18D) supportée sur le chariot ;
u) déplacer le chariot dans une quatrième position de formation de fronce ;
v) prendre en sandwich la quatrième ébauche (28D) entre la quatrième matrice de formation de fronce (18D) et la matrice de formation de fronce complémentaire (24), de façon à former par conséquent une quatrième ébauche froncée ;
w) déplacer le chariot dans une position d'éjection de quatrième ébauche ; et
x) éjecter la quatrième ébauche froncée du chariot.

19. Procédé selon la revendication 18, caractérisé en ce que la position de réception de quatrième ébauche correspond à la troisième position de formation de fronce, en ce que la quatrième position de formation de fronce correspond à la position d'éjection de troisième ébauche et à la position de réception de première ébauche, et en ce que la position d'éjection de quatrième ébauche correspond à la position de réception de deuxième ébauche et à la première position de formation de fronce.

20. Procédé selon l'une quelconque des revendications précédentes, caractérisé en ce que le chariot est une tourelle à quatre côtés (12A, 12B, 12C, 12D), qui tourne par quarts de cercle (13) en passant par ses différentes positions.

FIG 1A

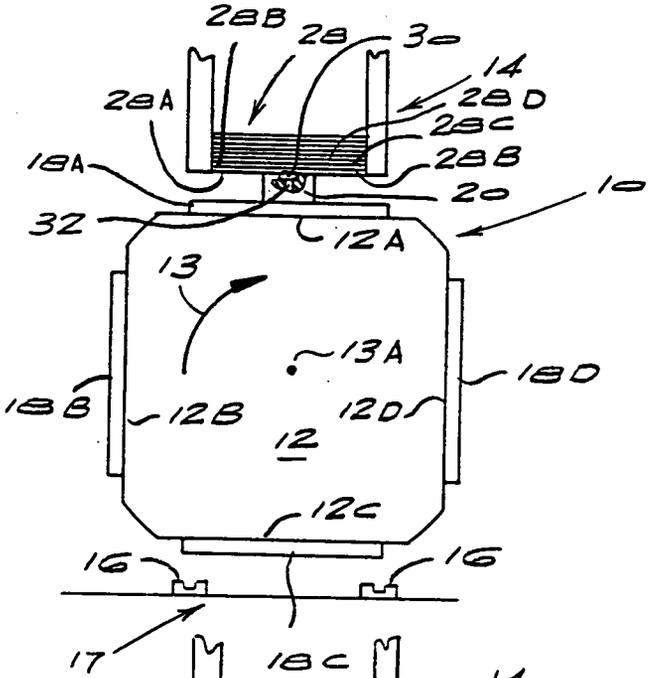


FIG 1B

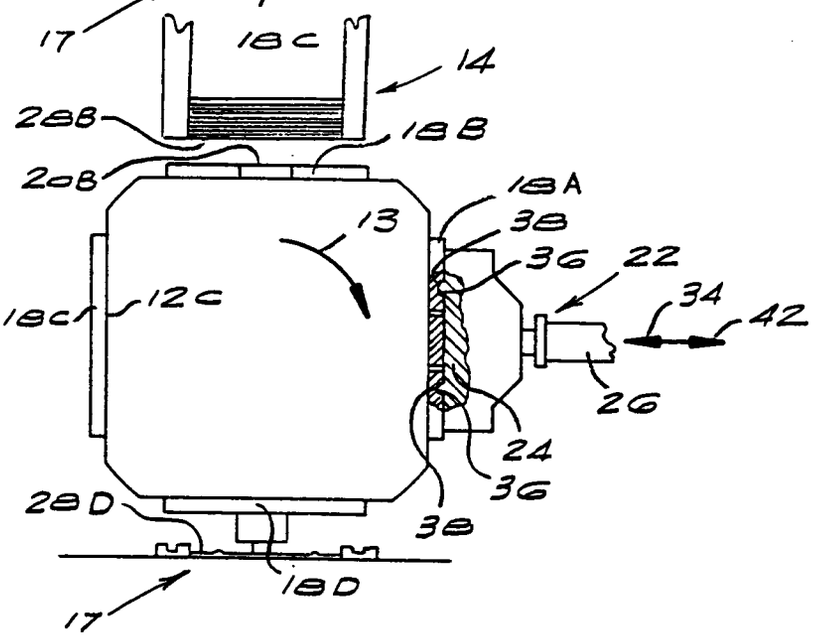


FIG 1C

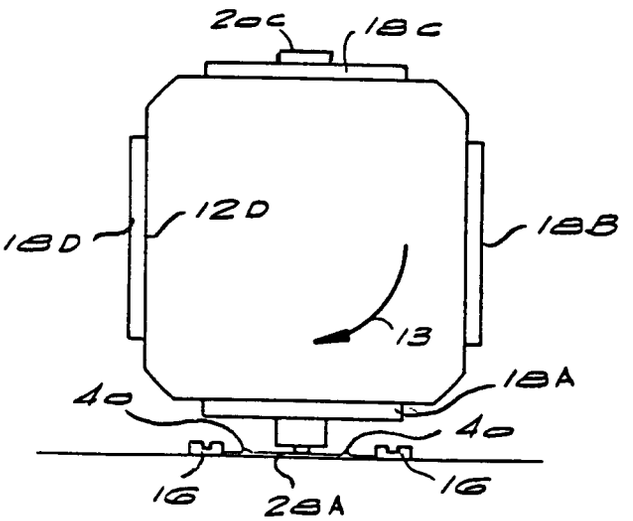


Fig 2

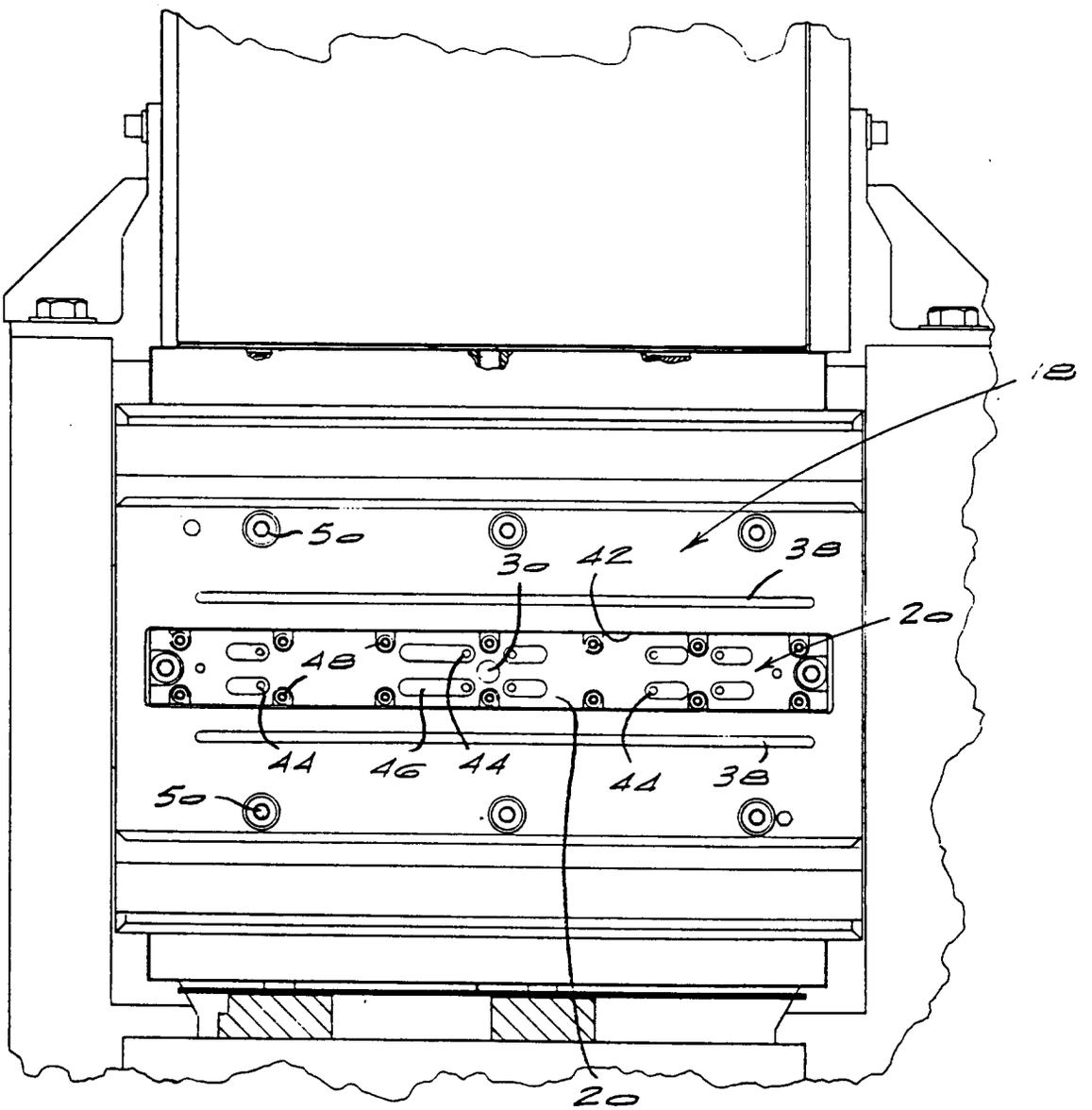
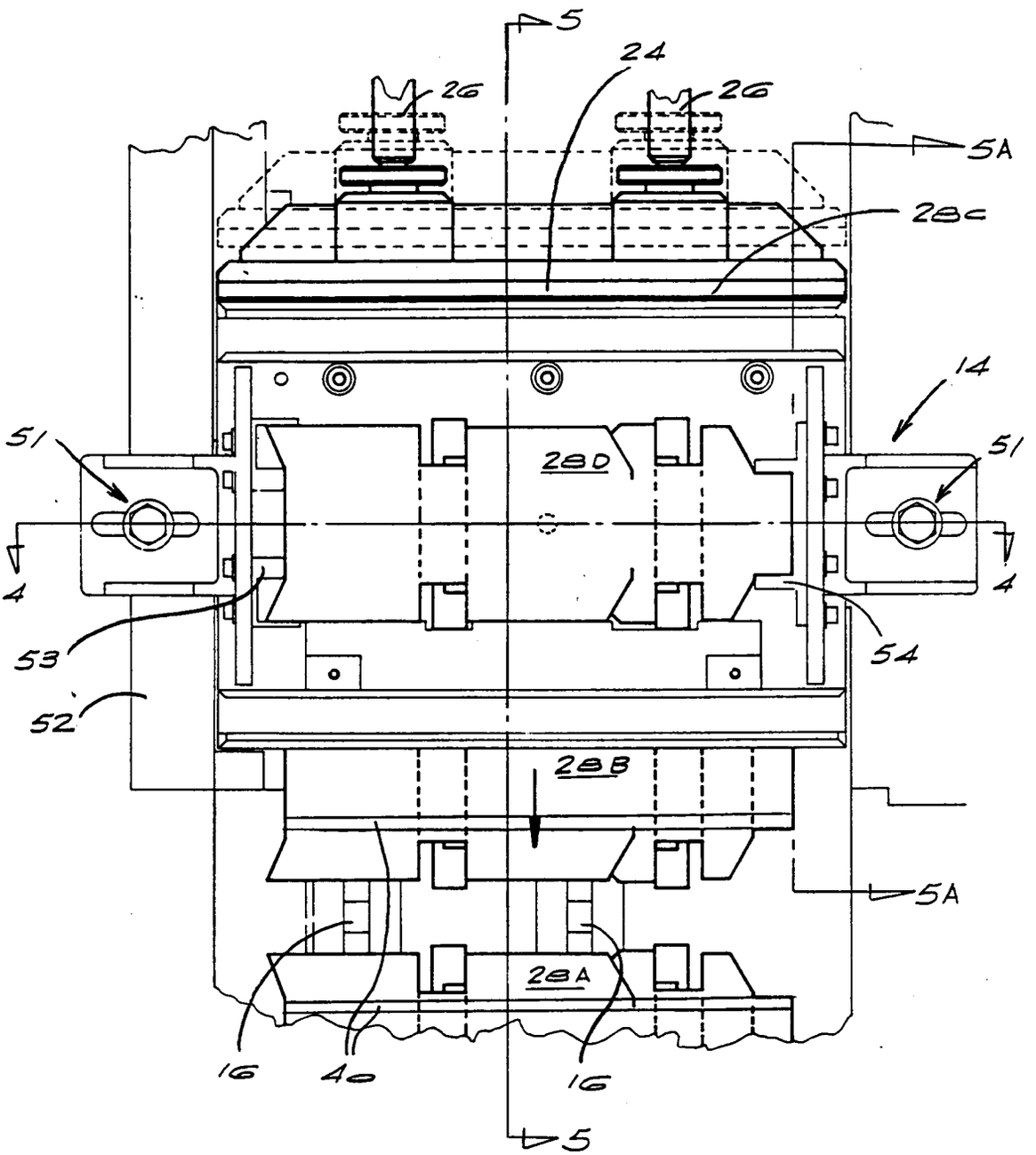


Fig 3



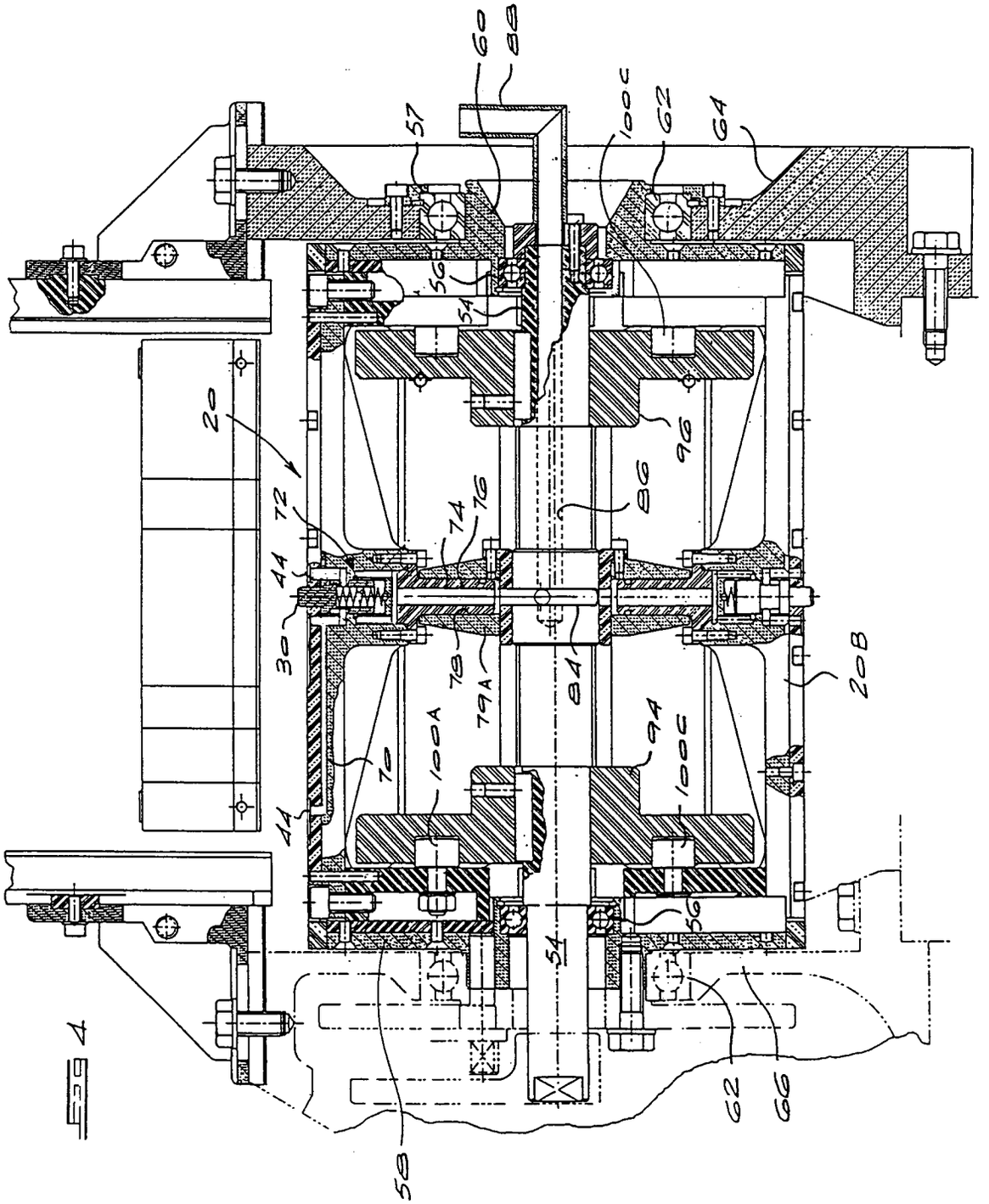

60
88
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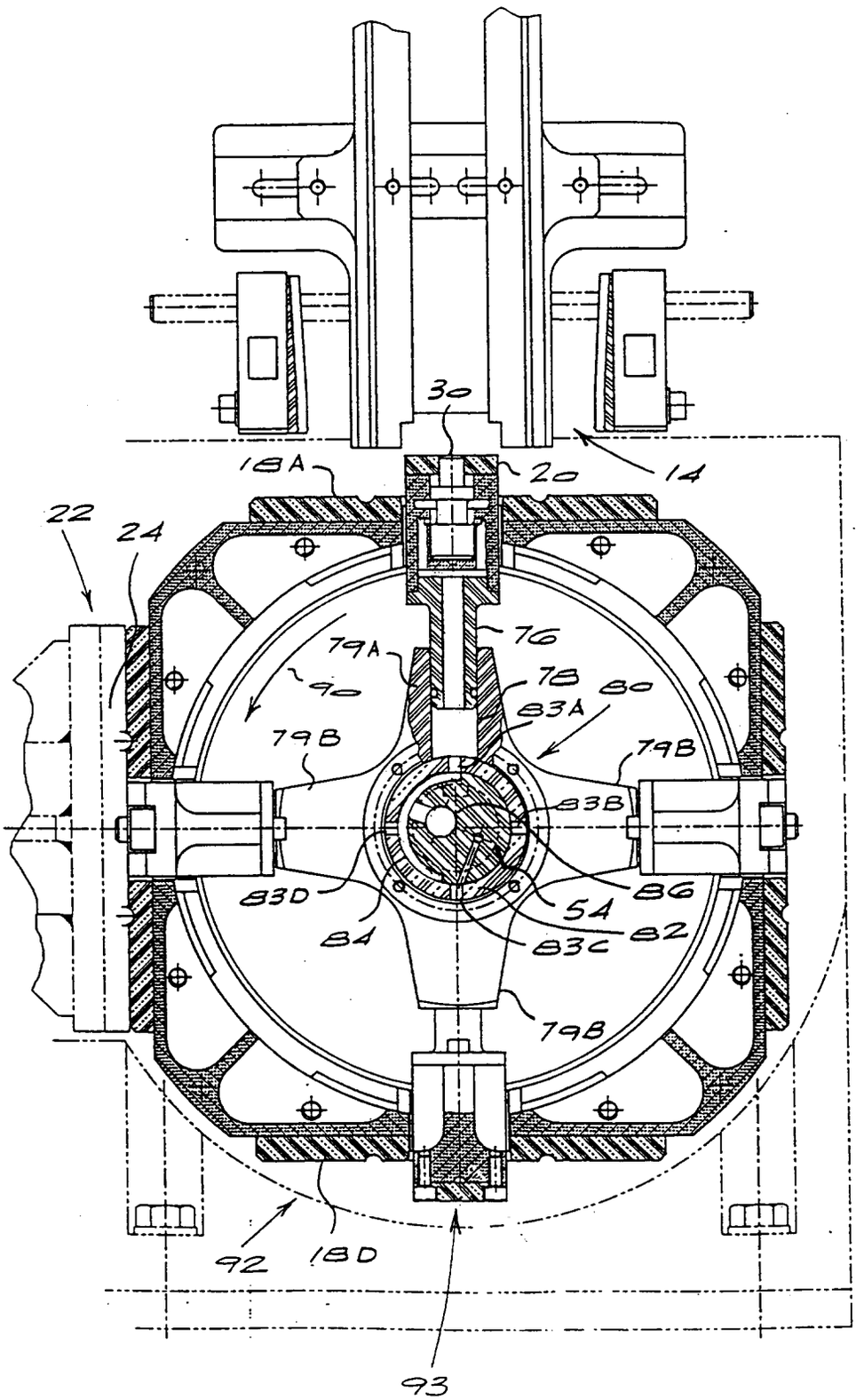
Fig. 4

Fig 5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76
79A
78
80
90
83A
79B
79B
83B
83D
86
54
84
82
83C
79B
92
18D
93

FIG 5A

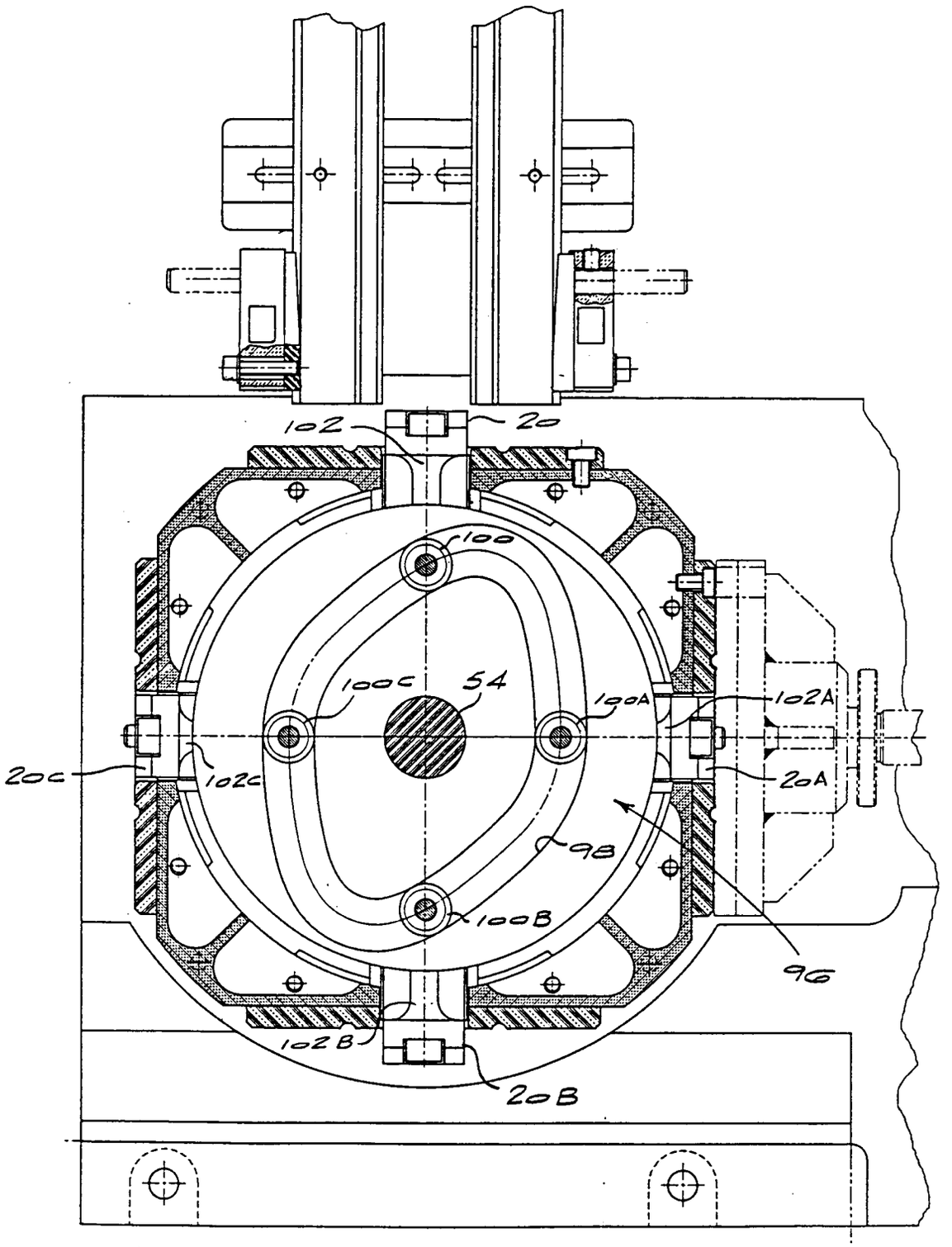
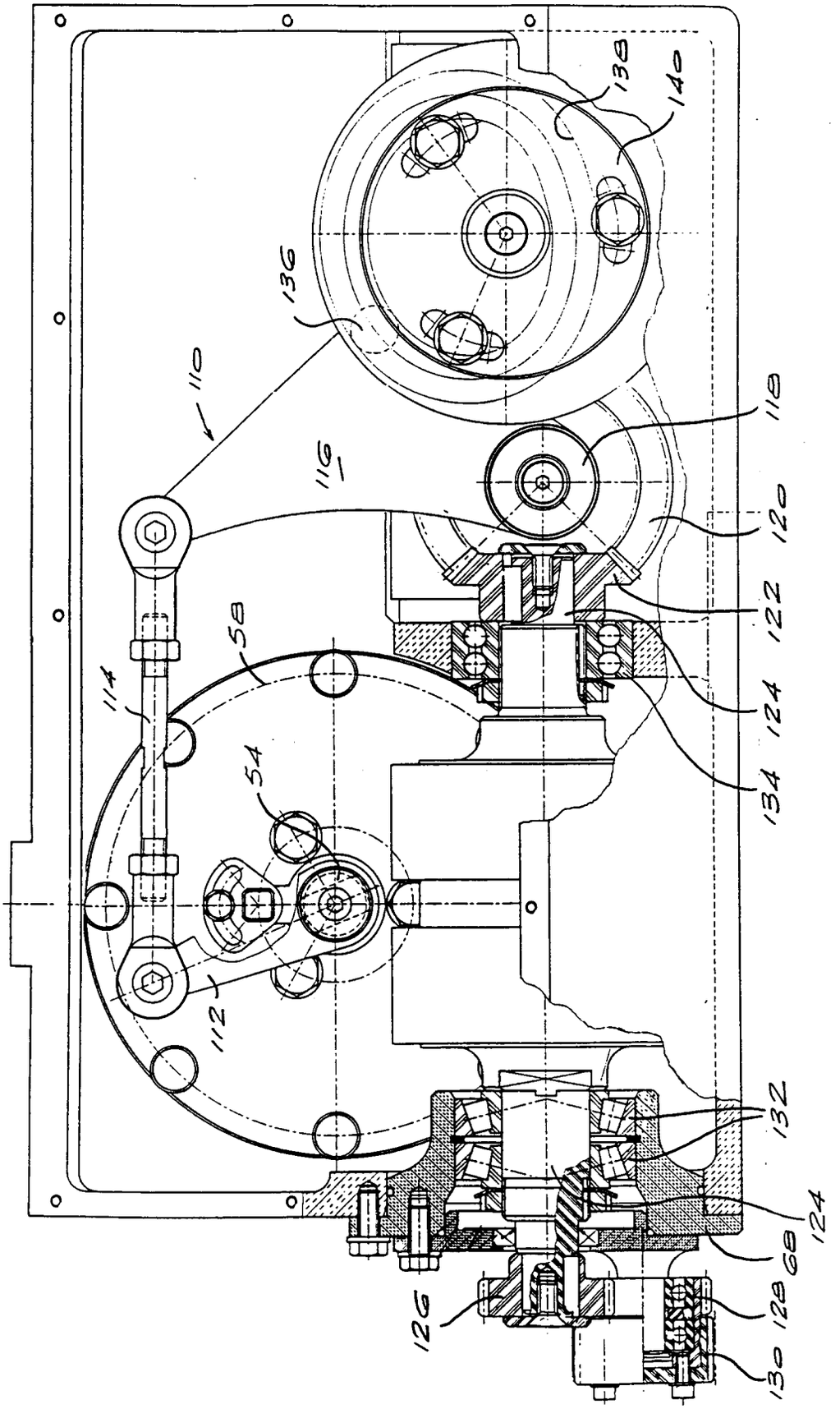


FIG 6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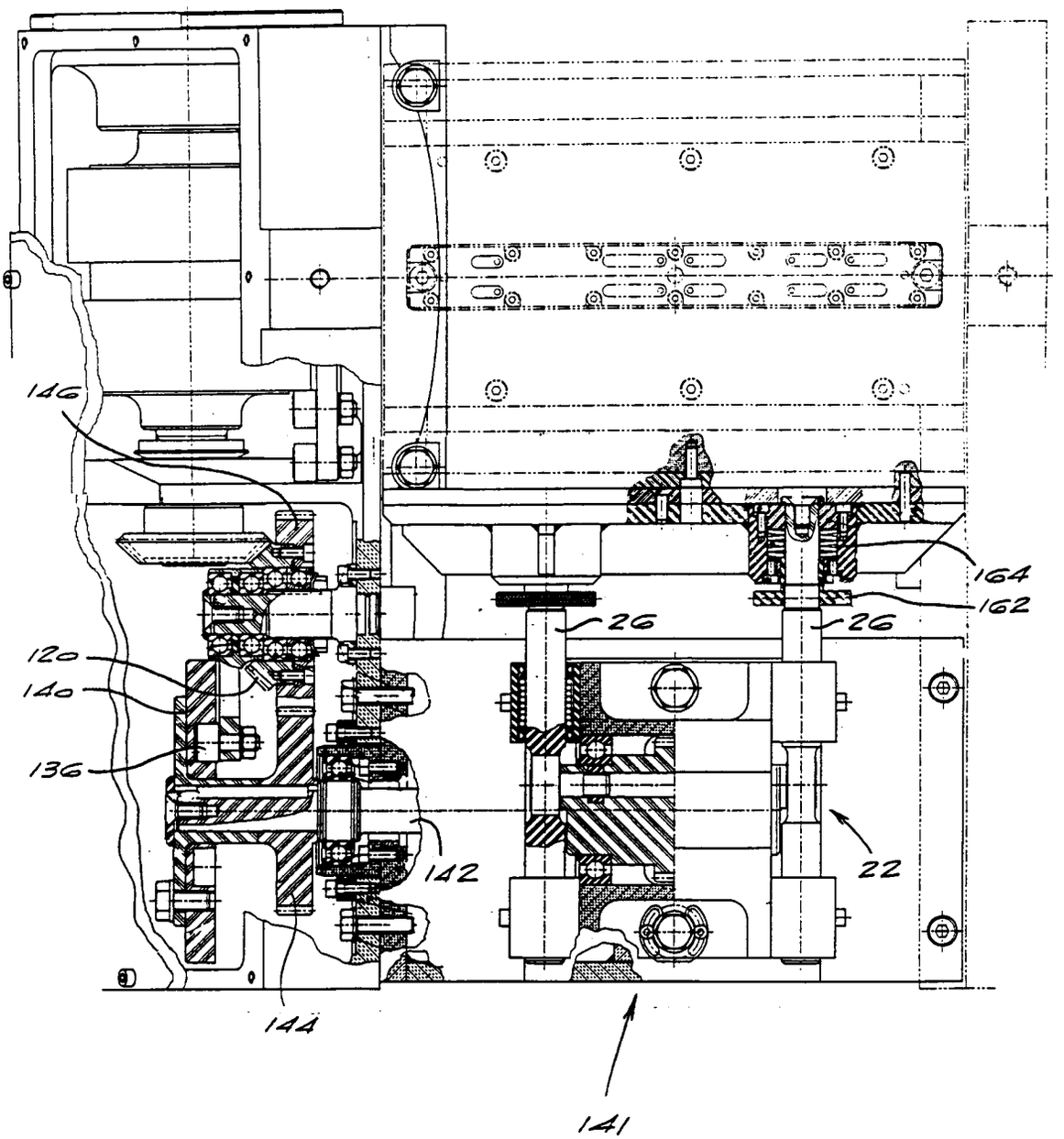
130

Fig 7



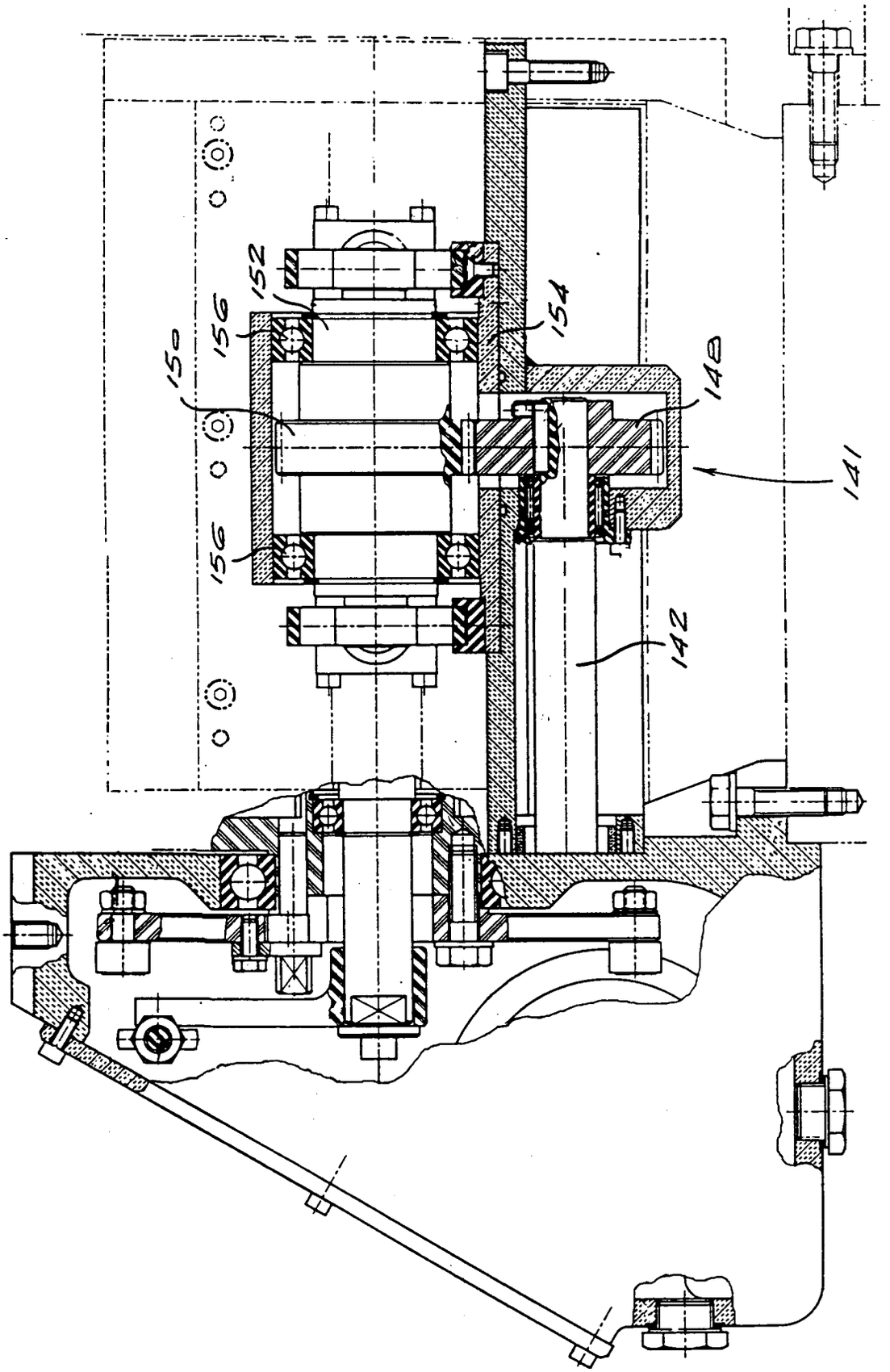


Fig 9

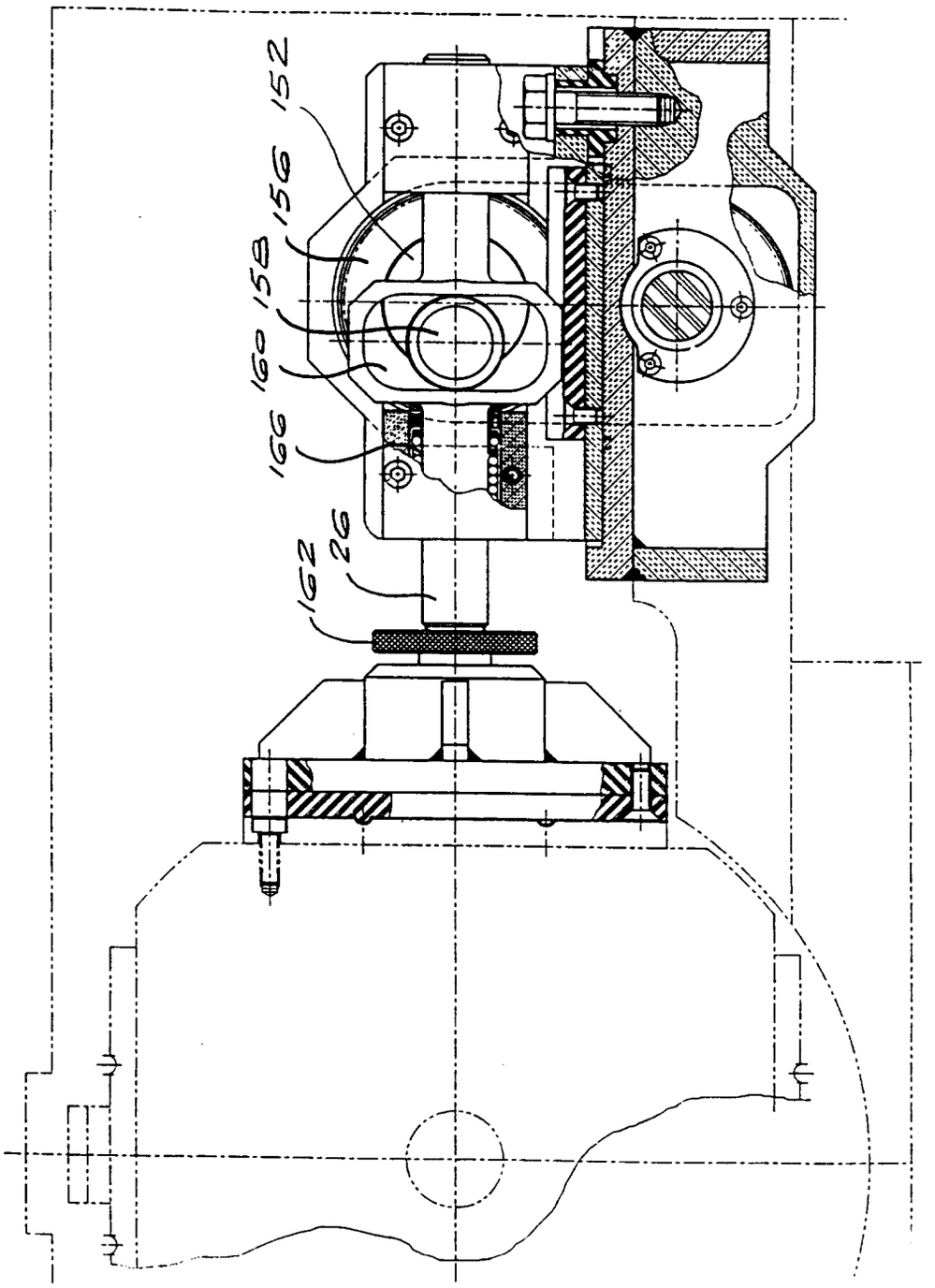


Fig. 6