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(54) **Bucket handle machine**

Maschine zur Herstellung von Eimertragbügeln

Machine pour la fabrication de poignées de seaux

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(56) References cited:

EP-A- 0 566 938	NL-A- 8 005 257
US-A- 1 575 037	US-A- 3 241 578
US-A- 3 675 305	US-A- 3 871 423

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Description

[0001] The invention relates to an apparatus for manufacturing a metal handle and placing this handle on a bucket. Apparatuses for providing plastic buckets with a metal handle are known per se from practice. The known apparatuses, however, are so-called dedicated machines specifically manufactured for a specific bucket with an associated specific handle. The machines cannot be readily made suitable for processing other types of buckets with differently shaped handles.

[0002] Such dedicated machines are known from e. g. NL-A-8005257, US-A-1 575 037, US-A-3 675 305 and US-A-3 871 423 although these machines are intended for providing cans with bails and not for providing buckets with handles. These dedicated machines are complicated and very costly. Only for very large production cycles of the same product the purchase of such a machine is feasible.

[0003] It is an object of the invention to provide an apparatus of a completely new design which can be readily made suitable for processing different types of buckets and different types of handles.

[0004] To this end, the invention provides an apparatus comprising a bucket moving module for feeding handleless buckets and carrying away buckets provided with handles, a handle manufacturing module for manufacturing handles from metal rod elements, a rod feeding module for feeding metal rod elements to the handle manufacturing module and a handle mounting module for mounting a handle on a handleless bucket, wherein the rod feeding module is adjustable for the feeding of rod elements of different lengths, the handle manufacturing module is adjustable for the manufacture of handles of different dimensions and/or shapes, and the bucket moving module is adjustable for the feeding and carrying away of buckets of different dimensions.

[0005] As a result of the modular construction, for instance, a bending head of the handle manufacturing module can be readily exchanged for another bending head suitable for manufacturing handles of a different form and/or dimension. The modular construction therefore provides the possibility of a high degree of flexibility.

[0006] Because of the adjustability of the modules it is not necessary to exchange a complete module, but the module can be adjusted for the processing of, for instance, rod elements of different lengths and buckets of different dimensions and/or shapes.

[0007] If desired, the handles can be provided with a grip. To this end, according to a further elaboration of the invention, the apparatus should be provided with a grip feeding module for feeding grips to the handle manufacturing module.

[0008] It is known that with respect to buckets with handles made of metal rods the ends of these handles are often provided with a knob-shaped thickening. In the known apparatuses this knob-shaped thickening is forcefully formed, more or less in the manner in which

the head is formed at a rivet. In this known method for manufacturing the knob-shaped ends the rod should be clamped very tightly, which leads to damage to the rod and, consequently, also to damage to the handle to be finally formed from the rod. Since during the formation of the knob-shaped ends hydraulic press apparatuses are often used, there is further the risk that hydraulic oil will pollute the bucket. Moreover, metal particles released in the known knob-forming process may become detached from the rod elements and end up in the interior of the buckets. Since the buckets are often used to pack food, such a pollution is very undesirable.

[0009] According to a further elaboration of the invention these problems are solved if the handle manufacturing module comprises two knob-forming heads which are arranged opposite each other and are each rotatable about a common axis of rotation and are arranged for axial movement in the direction of the axis of rotation, which knob-forming heads are each provided with a knob-forming element and at least one supporting element, which knob-forming element is provided with a forming surface which intersects the axis of rotation and makes an angle with the axis of rotation, while the at least one supporting element is intended for abutment on the outer surface of the rod element for taking up forces exerted on the rod end by the forming surface.

[0010] Through the rotation of the heads and the pressure force thereby exerted on the rod end, which pressure force is transferred via the forming surface, a knob of excellent quality will be very gradually formed at the end of the rod. The knob has a very smooth surface, so that placement of the rod in the bucket will be readily effected. Moreover, the outer surface of the rod need not be forcefully clamped, so that damage to this outer surface will not occur. The knob-forming process proceeds so gradually and with so little force that no metal particles become detached from the rod elements and, moreover, the use of hydraulic oil for the purpose of generating great forces can be left out.

[0011] For the handles manufactured with the known bucket handle machines the rod element was bent in a specific phase of the process to form a handle. As is known, metal has elastic properties. As a result thereof, to form a handle with a specific curvature, the rod should be bent during the bending operation with a stronger curvature. After this bending operation the rod will slightly spring back as a result of the elasticity. During the bending operation the selection of the stronger curvature was such that the spring-back resulted in a handle with the intended curvature. This is of great importance because the curvature defines the distance between the two ends of the rod. If this distance does not fit the diameter of the bucket, it will not be possible for the handle in mounted condition to swing easily with respect to the bucket. In practice, this is a substantial problem, because not all the rods have the same degree of elasticity. Even within a batch of rod elements substantial deviations can occur therein. According to a further elaboration

tion of the present invention these problems are solved if the handle manufacturing module is provided with a bending unit, by means of which the rod element is bent into a handle, which bending unit comprises a relaxation arrangement designed to carry out a plurality of plastic deformation operations, which deformation operations eventually effect no definitive deformation but only bring about a relaxation of the stresses existing in the bent rod element as a result of the bending of the rod element carried out by the bending unit.

[0012] The plastic deformations carried out by the relaxation arrangement are undone in subsequent plastic deformation operations by the same relaxation arrangement. As a result of such a treatment of the rod element bent into a handle, the stresses existing in the handle as a result of the bending will largely be removed. This has the great advantage that when bending the rod into a handle the curvature can be selected which the handle should eventually have. It is a fact that the elastic spring-back properties of the rod bent into a handle are removed under the influence of the plastic deformation operations carried out by the relaxation arrangement.

[0013] Further elaborations of the invention are described in the subclaims and will hereinafter be discussed in more detail on the basis of an exemplary embodiment, with reference to the drawing.

Fig. 1 is a side view of a bucket according to a first exemplary embodiment;

Fig. 2 is a side view of a bucket according to a second exemplary embodiment;

Figs. 3, 3A are respectively a front and a side view of a machine for forming and placing a handle on a bucket;

Figs. 4 and 4A are a front and a side view of the frame of the machine of Fig. 3;

Figs. 5 and 5A are a front and a side view of the rod feeding module, the grip feeding module and a part of the handle manufacturing module;

Figs. 6, 6A and 6B are a front and a side view of the rod feeding module, the grip feeding module and a part of the handle manufacturing module;

Figs. 7A-7C show the operation of a part of the rod feeding module;

Fig. 8 is a side view of the receiving disk at the upper side of the rod feeding module;

Figs. 9A-9C show the operation of a part of the grip feeding module;

Fig. 10 is a side view of the disk located at the upper side of the grip feeding module;

Figs. 11 and 11A are a front and a side view of a part of the handle manufacturing module;

Fig. 12 is a sectional view of the knob-forming head; Fig. 12A is a right side view of the knob-forming head from the sectional view of Fig. 12;

Fig. 13 shows the manner in which a knob is formed at a rod end;

Figs. 14 and 14A are a front and a side view of an-

other part of the handle manufacturing module for bending the rod with knob-shaped ends formed thereon;

Figs. 15 and 15A show the part of the handle manufacturing module of Fig. 14 in more detail;

Figs. 16, 16A and 16B are respectively a front, a side and a sectional view of an arm of the part of the handle manufacturing module of Fig. 15;

Figs. 17A-17F show the different phases of the bending of the rod into a handle and the bending over of the ends thereof;

Fig. 17G is a front view of the right bending head; Fig. 17I is a left side view of the bending head of Fig. 17G;

Fig. 17H is a right side view of the bending head of Fig. 17G;

Figs. 17K1-17K5 are a front view of the bending head during the different bending stages;

Figs. 17J1-17J5 are a sectional view taken on the line J-J from Fig. 17H in the different bending stages;

Fig. 17L1 is the left side view of the bending head before the start of the bending process;

Fig. 17L5 is a left side view of the bending head after termination of the bending process;

Fig. 18 shows the relaxation arrangement of the handle manufacturing module;

Fig. 19 is a cross-section taken on the line XIX-XIX of the handle manufacturing module of Fig. 18;

Fig. 20 is a developed view of the abutting elements of the relaxation arrangement during the relaxation process;

Figs. 21 and 21A show a take-over mechanism for moving a rod element from the knob-forming head to the bending apparatus of the handle manufacturing module;

Figs. 22 and 22A show the take-over mechanism in more detail;

Figs. 23 and 23A show the handle mounting module for taking up the bent handle from the bending apparatus and transferring this handle to the bucket;

Figs. 24 and 24A show the manner in which the handle mounting module is positioned with respect to the bending apparatus of the handle manufacturing module and the bucket in which a shaped handle is to be placed;

Figs. 25 and 25A are respectively a side and a top view of the handle mounting module;

Figs. 26A-26E show the different phases of taking up a handle and placing this handle on a bucket;

Figs. 27 and 27A are a front and a side view of the rod feeding module, the grip feeding module, the handle manufacturing module and the take-over mechanism for taking over a rod from the knob-forming heads and bringing this rod to the bending/relaxation arrangement;

Figs. 28 and 28A are a front and a side view of the frame of a feeding conveyor;

Figs. 29 and 29A are a front and a side view of the lifting unit in the frame;

Fig. 30 is a side view of the lifting unit in more detail;

Figs. 31 and 31A are a front and a side view of the supporting plate arranged for movement in the horizontal direction;

Fig. 32 is a top view of the supporting plate movable in the horizontal direction;

Figs. 33 and 33A are a front and a side view of a rotatable centering plate movable in the vertical direction;

Fig. 34 is a side view of the centering plate of Fig. 33 in more detail;

Fig. 35 is a top view of the centering plate of Fig. 34;

Figs. 36 and 36A are a front and a side view of a stacking unit;

Fig. 37 is a front view of the stacking unit in more detail;

Fig. 38 is a side view of the stacking unit in more detail;

Figs. 39 and 39A are a front and a side view of the outlet conveyor;

Figs. 40 and 40A show the different parts of the bucket moving module in connection with each other, while the handle mounting module is also shown.

[0014] The exemplary embodiment of an apparatus according to the invention described hereinafter is especially intended for buckets as shown in Figs. 1 and 2. The bucket comprises a bucket body E and a handle H. The handle H is attached to the bucket edge R of the bucket body E. If desired, a grip G may be attached to the handle H, which is shown in Fig. 1. As clearly shown, the handle H is provided at the free ends with knob-shaped thickenings K which ensure that the ends of the handle H cannot slide out of the bucket edge R. The handle H is formed from a metal rod S and is placed on the bucket body E after forming the knob-shaped thickenings thereon and carrying out the different bending operations. All these operations are carried out by means of the apparatus according to the invention, an exemplary embodiment of which is shown in Figs. 3 and 3A in front and side view, respectively.

[0015] In view of the large number of parts from which the apparatus is built up, the various parts will hereinafter be discussed separately with reference to the drawings. To this end, the positions of the relevant individual parts with respect to the frame are shown, in each case in similar general views as shown in Figs. 3 and 3A, with omission of the other parts of the apparatus.

[0016] The present exemplary embodiment shows an apparatus comprising a bucket moving module for feeding handleless bucket bodies E and for carrying away buckets E provided with handles H. The apparatus further comprises a handle manufacturing module 150-180 for manufacturing handles H from metal rod elements S. Furthermore, the apparatus comprises a rod feeding module 90-110 for feeding metal rod elements S to the

handle manufacturing module 150-1250. Finally, a handle mounting module 260 is provided for mounting a handle H on the handleless bucket body E.

[0017] Figs. 4 and 4A are a front and a side view of the frame 10 of the apparatus. Figs. 5 and 5A are a similar view as shown in Figs. 4 and 4A, in which the rod feeding module 90-110, a part 150-180 of the handle manufacturing module and the grip feeding module 120-140 for feeding grips G to the handle manufacturing module 150-180 are shown. Figs. 5 and 5A are only for the purpose of showing the positioning of these parts in the frame 10. To accurately show the above parts, reference is made to Figs. 6, 6A, 6B, 7A, 7B, 7C, 8, 9A, 9B, 9C, 10, 11, 11A, 12, 12A and 13, to which reference is made in the following description.

[0018] The rod feeding module 90-110 comprises a lifting apparatus 90 provided with imbricated plate elements 100. By means of a drive 101 the positions of the imbricated plate elements 100 can be shifted with respect to each other. A number of different positions is shown in Figs. 7A-7C. As clearly shown in these successive figures, a rod S can be gradually lifted by the mutual movement of the imbricated plate elements 100. Such a manner of lifting rod elements has the special advantage that at the upper side of the lifting apparatus 90 only one rod element is fed at a time. It is a fact that the width of the upper edge 105 of the imbricated plate elements 100 is such that only one rod S can be placed thereon. Should, e.g., two rods S be taken up at the lower side of the lifting apparatus 90 of the rod feeding module, then one of these two rods will fall down during the lifting process. Moreover, this manner of lifting has the advantage that crooked rods S will fall down during the lifting process, so that eventually only straight rods S will be processed further. Located at the upper side of the lifting apparatus 90 are disks 110 for receiving the rod elements S. Fig. 8 shows the disk 110 in detail. At the circumferential side each disk 110 is provided with recesses 111 in which a rod S can be received. The disk 110 rotates intermittently, so that a recess 111 is always ready for receiving a next rod element S. It is to be noted that the rod feeding module 90-110 comprises two lifting apparatuses 90, 90', the mutual distance of which is adjustable, so that rod elements S of different lengths can be processed. It is self-evident that when adjusting the mutual positions of the lifting apparatuses 90, 90' the disks 110 also have to be adjusted by moving them along the shaft 112.

[0019] The grip feeding module 120-140 also comprises a lifting apparatus 120, which is provided with imbricated plate elements 130. The operation of this lifting apparatus 120 is comparable to the lifting apparatus 90 of the rod feeding module 90-110. Fig. 6B is the side view of the grip feeding module, which clearly shows that the imbricated plate elements 130 thereof have a width larger than that of the rod feeding module 90-110. At the upper side of the lifting apparatus 120 of the grip feeding module there is also a disk 140 for receiving

grips G. The imbricated plate elements 130 and the mutual position changes thereof are once more clearly shown in Figs. 9A-9C. It clearly appears from these figures whether a grip G rests on the upper side 135 of a plate element 130 and is transferred from the upper edge 135 of a lower plate element 130 to the upper edge 135 of a higher plate element 130. In explanation, Fig. 10 further shows the receiving disk 140 for the grips G. This receiving disk 140 is provided at its circumference with recesses 141, each of which can receive one grip G. After a rod element S and a grip G have been lifted and received in the respective disks 110, 140, the rod element is moved to the right in the axial direction by means provided for the purpose. The rod element S thereby moves through the grip G, so that the grip G is positioned approximately in the middle of the rod element S.

[0020] In the vicinity of the disks 140 there is also a part 150-180 of the handle manufacturing module. It is a fact that this handle manufacturing module is provided with two knob-forming heads 150, 160, by means of which the knob-shaped thickenings K can be formed at the ends of the rod-shaped element S. The disks 110, 140 bring a rod-shaped element S with or without a grip G mounted thereon into a position which is in line with the axis of rotation of the knob-forming heads 150, 160. By means of a clamp 165 (see Figs. 11, 11A) the rod element S is pressed against the disks 110 so as to prevent co-rotation and axial movement of the rod element S during and after the knob-forming process, respectively. The knob-forming heads 150, 160 are arranged for movement in the axial direction A and are rotatable. The clamp 165 is energized by a piston/cylinder assembly 166 or by exerting a spring force. Fig. 12 shows the knob-forming head 150 in detail. The knob-forming head 150, 160 is provided with a knob-forming element 170 which is bearing-mounted in the rotatable head 150 for rotation. The knob-forming element 170 is provided with a forming surface 175 which intersects the axis of rotation L of the head 150 and makes an angle therewith. Furthermore, the head 150, 160 is provided with supporting elements 180 intended for abutment on the outer surface of the rod element S to take up the forces exerted on the rod end by the forming surface 175. By rotation of the head 150 and exertion of a slight axial force by moving the head 150 in the axial direction A, there will be formed, as shown in Fig. 13, a thickening K at the end of the rod S. The head 150 is driven by a motor 152 via a belt transmission 151. For the head 160 there is provided a separate motor 162. The axial movement of the knob-forming heads 150, 160 is always oppositely directed and is effected by a motor 153 which moves the knob-forming heads 150, 160 in the axial direction by means of two curves via two control rods.

[0021] After forming the knob-shaped thickenings K at the rod ends the rod is picked up from the recesses 111 in the disks 110 by means of a transfer mechanism 280 and transferred to a bending unit 190-250. The po-

sition of the bending unit 190-250 in the frame is shown in Figs. 14 and 14A, while the structural details of the bending unit 190-250 are shown in Figs. 15, 15A, 16, 16A, 16B, 18, 19 and 20. The effect of the bending operation is shown in Fig. 17. The transfer mechanism 280 for moving a rod S from the disks 110 to the bending apparatus 190-250 is shown in Figs. 21, 21A and in more detail in Figs. 22, 22A.

[0022] The transfer mechanism (see Fig. 22) is provided with four clamps 281 mounted on a shaft system 82 within which there is included a control shaft 285, which control shaft 285 can be rotated with respect to the outside shaft 282 by means of a piston/cylinder assembly 286. The inside shaft 285 is actively connected with the jaws 287 of the clamps 281, so that they can be opened and closed. Furthermore, this entire assembly is mounted on a sledge 284 which is arranged along a guide 283 for up and down movement. Figs. 22, 22A show the clamps 281 in an uppermost position in full lines and in a lowermost position in dotted lines. From the lowermost position the clamps 281 take up the rod from the recesses 111 in the disks 110. Then the clamps move up into the uppermost position, so that the ends of the clamps are received in bending heads 200 of arms 190 of the bending unit 190-250.

[0023] The arms 190 are movably connected with a frame part 191 (see Fig. 15). This connection enables a horizontal movement of the arms 190 toward and away from each other. Arranged in the arms 190 are bending heads 200, by means of which the ends of a rod S can be bent through 90°. In explanation, Figs. 16, 16A, 16B show a single arm 190 in more detail. The bending head 200 is provided at a free end with a groove in which a rod end can be received. The bending head 200 is bearing-mounted in the arm 190 for rotation and is driven by means of a toothed belt 193 which is driven by means of a piston/cylinder assembly 192. The piston/cylinder assembly 192 and the toothed belt 193 are included in the arm 190. By changing the position of the piston/cylinder assembly 192 the belt 193 is moved, which results in a rotation of the bending head 200. Suspended from the frame plate 192 is further a bending unit 215 arranged for movement in the vertical direction. To this end, the bending unit 215 is provided with a guide 216, the height adjustment of which takes place by means of an electric motor 244 and an associated toothed belt 218. The bending unit comprises a bending head 219 having a radius of curvature corresponding to the intended radius of curvature of the handle H. The manner in which the rod S is bent into a handle H is shown in Fig. 17.

[0024] The rod S is received in the bending head 200, as shown in Figs. 17K1-17K5 and Figs. 17J1-17J5. Fig. 17G is a front view of the bending head 200 from the right side of Figs. 17A-F. Clearly visible is the insertion groove 201. When placing the rod S in the head, it is placed in the bending head 200 via the insertion opening of the groove 201. It clearly appears from the left and

right side views of the bending head 200 (Figs. 17I and 17H) that the insertion groove 201 has a key hole form. From the cross-section on the line J-J from Fig. 17H, which cross-section is shown in Fig. 17J, it clearly appears how the head 200 is designed at the height of the rod S. Clearly visible is the abutting face 202 against which the knob-shaped thickening K of the rod element S is drawn during the bending process. Moreover, the sectional view clearly shows the nose 203 which plays a crucial role in the bending of the ends of the rod S. From the front views of Figs. 17K1-17K5 it clearly appears that after the start of the bending process the rod S can no longer be removed from the bending head 200. After termination of the bending process the rod can only be moved out of the groove 201 in the longitudinal direction of the bent end. The key hole form of the groove 201 prevents the removal of the rod S from the bending head 200 in the forward direction. During the bending process the following operations take place after the insertion of the rod S into the bending heads 200: the bending heads 200 are rotated an eighth of a turn, so that an engagement based on friction starts between the bending heads 200 and the rod. Subsequently, the bending unit 215 is moved down, while at the same time the arms 190 are moved toward each other. Besides, a further rotation of the bending heads 200 takes place, which is clearly shown in Figs. 17C, 17D and Figs. 17K2, 17K3. In order to bend the ends of the rod through 90°, the bending heads 200 rotate the fourth of a turn further, so that the state of Figs. 17E and 17K4 is obtained. Subsequently, the bending heads are rotated back through 45°, so that the rod S can be moved in the axial direction of the bent end thereof out of the groove 201 in the bending head 200 and can then be transferred to the bucket. As a result of the abutting face 220 against which the knob-shaped thickening K of the rod S is drawn during the bending process, the bending operations of the rod and the bending of the ends thereof take place under tensile stress. As a result of this tensile stress prevailing in the rod, very taut bends can be bent in the rod S. If in this stage the bent rod S were removed from the bending heads 200 of the arms 190, it would partially bend back in connection with the stresses existing in the rod. This is prevented by providing the forming head 215 with a relaxation arrangement.

[0025] The relaxation arrangement is shown in more detail in Figs. 18, 19 and 20. The relaxation arrangement of the bending head 219 comprises a plurality of juxtaposed abutting elements 220, which are provided with a receiving slot 230 for partially receiving therein the bent rod element S. The abutting elements 220 are movably arranged, in the present case in a direction perpendicular to the plane in which the rod S is bent. Each abutting element 220 is further provided with a cam path groove 240 with a wide inlet side and a wide outlet side. Furthermore, the relaxation arrangement is provided with a rotatably driven disk 241, which carries a plurality of cams 250 staggered with respect to each other in a

direction perpendicular to the plane in which the bent rod is located. By rotation of the disk 241 the cams 250 successively move through the cam path grooves 240 of the juxtaposed abutting elements 220, so that the cams 250 successively impose a movement on the abutting elements 220. As a result of this movement, the rod S is locally subjected to plastic deformation, which deformation operations do not effect a definitive deformation but only bring about a relaxation of the stresses existing in the bent rod element S as a result of the bending of the rod element S accomplished by the bending unit. The cams 250 leading during the relaxation operation impose the greatest plastic deformation, while the trailing cams 250 impose an increasingly smaller deformation, until eventually no deformation exists anymore. In the present exemplary embodiment only half of the circumference of the disk 241 is provided with cams 250. The other half of the circumference is of plain design. Fig. 19 is a sectional view in which the disk 241, the abutting elements 220 and the cams 250 are visible. Fig. 20 is a developed view of the abutting elements during the deformation process. In this developed view it is clearly visible that the deformation on the left in the figure is still great, while the deformation on the right in the figure is practically nil. The exemplary embodiment of the bending head, as shown in Figs. 18-20, differs from the bending head 219 from Fig. 15 in that the former is suitable for the manufacture of handles H without grip G, while the latter is suitable for the manufacture of handles H with grip G. To this end, the bending head 219 from Fig. 15 is provided with a pressing block 217 which is movable up and down with respect to the bending head 219, and by means of which the handle H can be provided on both sides of the grip G with a bend to limit the lateral movement of the grip G. Fig. 15A further shows the motor 242, by means of which the disk 241 is driven. Furthermore, Fig. 15A shows a motor 243, by means of which the pressing block 217 is movable in the vertical direction.

[0026] After the handle H has thus been formed, a handle mounting module 260 (see Figs. 23-25) provided with two handle mounting heads 265 takes up the handle from the arms 190 of the bending unit 215. The position of the handle mounting module 260 with respect to the frame is clearly shown in Figs. 23, 23A. Fig. 25 is a side view of the handle mounting module 260 in more detail, and Fig. 25A is a top view of the handle mounting module 260. The two handle mounting heads 265 are connected with the ends of swiveling arms 266. The handle mounting heads 265 are each provided with an outer cylinder 267 and an inner cylinder 268, see Figs. 26A-26E. The outer cylinder 267 is rotatable with respect to the inner cylinder 268. The outer cylinder 267 is provided with a straight longitudinal groove, and the inner cylinder 268 is provided with a helical groove. By rotation of the outer cylinder 267 with respect to the inner cylinder 268 the ends of a handle H can be taken up by a handle mounting head 265 and moved in the axial di-

rection. Moreover, the heads 265 as a whole can be moved by means of the swiveling arms 266. Both the outer cylinder 267 and the inner cylinder 268 are rotatable with respect to the swiveling arms 266. The movement of the swiveling arms 266, the outer cylinder 267 and the inner cylinder 268 is controlled by means of a cam box 269, which is driven by a motor 270. Via a plurality of toothed belt transmissions extending through the arms 266 the movement controlled by the cam box 269 is transferred to the outer cylinder 267 and the inner cylinder 268. Figs. 26A-26E show the manner in which the handle is taken up from the arms 190 of the bending unit and then placed again in the edge R of the bucket E, in which two holes are provided for receiving the ends of the handle H. When placing the handle H, the ends thereof are not only pressed toward each other in the axial direction, but by slightly swiveling the outer cylinder 267 backwards and forwards a kind of levering movement is effected, which causes the knob-shaped thickenings K to move more easily through the openings in the edge R of the bucket E. Of course, the bucket E should be accurately positioned before the handle can be mounted therein.

[0027] To this end, the apparatus is provided with a bucket moving module, which will hereinafter be discussed in more detail with reference to Figs. 27-40.

[0028] Figs. 27 and 27A are again a front and a side view of the above-discussed modules with omission of the handle mounting module 260.

[0029] The rod elements S are located in a magazine 97 near the lower side of the lifting apparatus 90, while the grips G are stored in a reservoir 129, which is provided with an inclined bottom, so that the grips G are passed to the lower side of the lifting apparatus 120. Figs. 28-40 show the different parts of the bucket moving module and the positions of these parts with respect to the frame 10. The bucket moving module 20-80 is provided with a feeding conveyor 20, by means of which a bucket E can be introduced into the apparatus (see Figs. 28 and 28A). Arranged above the free end of the feeding conveyor 20 is a lifting apparatus 30 (see Figs. 29, 30), by means of which a bucket located on the feeding conveyor 20 can be lifted. To this end, the lifting apparatus 30 is provided with a suction plate 31 which is connected via an arm 32 with a vertical guide 33. Connected to the suction plate 31 is a suction line 34, by means of which a reduced pressure can be created below the plate 31 so as to suck a bucket E against it. Instead of the suction plate 31, there can also be used a suction pad engaging the bottom of the bucket E. By means of this lifting apparatus 30 the bucket E can then be placed on a supporting plate 40 arranged for movement in the horizontal direction, the position of which with respect to the frame 10 is clearly shown in Figs. 31 and 31A. A top view of the plate 40 movable in the horizontal direction with the associated guide 41 is shown in Fig. 32. The plate 40 will be in a right-hand position when the lifting apparatus 30 places a bucket E thereon. Subsequently, the plate

40 moves to a left-hand position shown in Fig. 31, so that the bucket is approximately in the middle of the apparatus. At that place the apparatus is provided with a rotatable centering plate 50 (see Figs. 33, 34, 35), which is arranged for up and down movement. The position of the vertically movable, rotatable centering plate 50 with respect to the frame 10 is clearly visible in Figs. 33 and 33A. Fig. 34 is a side view of the centering plate 50. It is clear that via the guide 51 the plate is movable up and down in the vertical direction. The rotational position of the plate is controlled by means of a toothed belt 52. A vacuum line is also connected to this centering plate 50, so that the bucket E can be sucked against it. Rotation of the bucket E is necessary to enable bringing the holes in the edge R of the bucket E into such a position that the ends of the handle H can be pressed into them. To this end, there can be used an electric eye which observes the holes, and which, on the basis of this measurement, transmits to the control of the motor, for the purpose of rotation of the centering plate 50, such a signal that the holes in the edge R reach the desired position. The centering plate 50 is provided with an edge falling within the circumferential edge R of the bucket E, so that the edge of the centering plate 50 prevents the deformation of the bucket E as a result of the force exerted thereon when placing the handle H.

[0030] After the handle H has been placed, the centering plate 50 moves down again, and the vacuum is released, so that the bucket E is placed again on supporting plate 40 arranged for movement in the horizontal direction. This supporting plate 40 is then again in the right-hand position, so that meanwhile a second bucket can be placed on the right side of the supporting plate 40. Subsequently, the supporting plate 40 arranged for movement in the horizontal direction again moves to the left, and the bucket E located on the left side of this plate can be taken up by a stacking unit 70, the position of which with respect to the frame 10 is shown in Figs. 36 and 36A.

[0031] This stacking unit 70, which is shown in detail in Figs. 37 and 38, comprises two supporting arms 71. These supporting arms 71 are connected with an inclined longitudinal guide 72 so as to be freely movable. Both longitudinal guides 72 and the supporting arms 71 connected therewith are connected with a plate 73, which is connected with a longitudinal guide 74 for up and down movement. The supporting arms 71 have a slightly inclined run-on edge 75. When the plate 73 moves down, the supporting arms 71 at a given moment touch the upper edge R of a bucket E located on the plate 40. When the plate 73 moves further down, the supporting arms 71 will move out along the inclined guides 72, until they have such a position that they can pass the edge of the bucket E. The plate 73 will move a little further down and then be moved up again. With this upward movement the supporting arms 71 will automatically assume the lowest possible position on the guides 72, while abutting on the wall edge of the bucket.

When the plate 73 moves up further along the guide 74, the supporting arms 71 will move out along the inclined guides 72, until they have such a position that they can pass the edge of the bucket E. The plate 73 will move down a little further and then be moved up again. With this upward movement the supporting arms 71 will automatically assume the lowest possible position on the guides 72 while abutting on the wall edge of the bucket. When the plate 73 moves up further along the guide 74, the supporting arms 71 will at some moment contact the lower side of the edge R of the bucket E and lift the bucket E when the plate 73 moves up further. By repeating these operations a stack of buckets E is automatically formed. This stack of buckets is lifted by the supporting arms 71, until the stack has such a height that it can be carried away. To this end, the apparatus is provided with an outlet conveyor 80, which is shown in Figs. 39 and 39A. To this end, the plate 73 moves down completely via the vertical straight guide 74, until the lowermost bucket of the stack rests on the transport surface of the outlet conveyor 80. To prevent the stack from being lifted again when the plate 73 with the associated supporting arms 71 moves up, there may be provided two energized piston/cylinder assemblies 76 which can temporarily push the supporting arms 71 to an outermost position.

[0032] The position of the different parts of the bucket moving module and the position of the handle mounting module are once more clearly shown in Figs. 40, 40A, while omitting, for clarity's sake, the parts of the rod feeding module 90-110, the grip feeding module 120-140 and the handle manufacturing module 150-250.

[0033] Because of the modular construction of the apparatus the different parts thereof can be readily adapted to the shape and dimensions of the buckets, rod elements, grips to be processed, and handles to be formed. This therefore results in a universal apparatus delivering buckets with handles of high quality. Moreover, as a result of the special construction of the bending heads 200 the bent ends may have a smaller length, which is favorable for the width of the edge R of the bucket E, which is necessary to receive the ends of the handle H. Accordingly, by means of the apparatus according to the invention buckets E can be manufactured with a relatively narrow edge R.

[0034] It is self-evident that the invention is not limited to the exemplary embodiment described, but that various modifications are possible within the scope of the invention.

Claims

1. An apparatus comprising a bucket moving module (20-80) for feeding handleless buckets (E) and carrying away buckets (E) provided with handles (H), a handle manufacturing module (150-250) for man-

ufacturing handles (H) from metal rod elements (S), a rod feeding module (90-110) for feeding metal rod elements (S) to the handle manufacturing module (150-250), and a handle mounting module (260) for mounting a handle (H) on a handleless bucket (E), the rod feeding module (90-110) being adjustable for the feeding of rod elements (S) of different lengths, the handle manufacturing module (150-250) being adjustable for the manufacture of handles (H) of different dimensions and/or shapes, and the bucket moving module (20-80) being adjustable for the feeding and carrying away of buckets (E) of different dimensions.

2. An apparatus according to claim 1, **characterized in that** it is provided with a grip feeding module (120-140) for feeding grips (G) to the handle manufacturing module (150-250).
3. An apparatus according to claim 2, **characterized in that** the grip feeding module (120-140) is adjustable for the feeding of different types of grips (G).
4. An apparatus according to any of the preceding claims, **characterized in that** the handle manufacturing module (150-180) comprises two knob-forming heads (150, 160) which are arranged opposite each other and are each rotatable about a common axis of rotation and are arranged for axial movement in the direction of the axis of rotation, the knob-forming heads (150, 160) are each provided with a knob-forming element (170) and at least one supporting element (180), the knob-forming element (170) is provided with a forming surface (175) which intersects the axis of rotation and makes an angle with the axis of rotation, while the at least one supporting element (180) is intended for abutment on the outer surface of the rod element (S) for taking up forces exerted on the rod end by the forming surface (175).
5. An apparatus according to any of the preceding claims, **characterized in that** the handle manufacturing module (150-250) is provided with a bending unit (190-250), by means of which the rod element (S) is bent into a handle (H).
6. An apparatus according to claim 5, **characterized in that** the bending unit (190-250) comprises a relaxation arrangement (220-250) designed to carry out a plurality of plastic deformation operations, which deformation operations effect no definitive deformation but only bring about a relaxation of the stresses existing in the bent rod element (S) as a result of the bending of the rod element (S) carried out by the bending unit.
7. An apparatus according to claim 6, **characterized**

in that the relaxation arrangement comprises a plurality of juxtaposed abutting elements (220) which are provided with a receiving slot (230) for partially receiving therein the bent rod element (S), the abutting elements (220) are movably arranged, each abutting element (220) is provided with a cam path groove (240), the relaxation arrangement is provided with at least one movably arranged cam (250) which is movable through the cam path grooves (240) of the successive abutting elements, and the cam imposes a movement on at least a number of the abutting elements (220).

8. An apparatus according to claim 7, **characterized in that** the apparatus is provided with a plurality of cams (250), the arrangement of the successive cams (250) is such that the first cams (250) moving along impose a plastic deformation on the bent rod (S), while the last cams moving along substantially undo the deformations imposed on the bent rod (S).
9. An apparatus according to any of the preceding claims, **characterized in that** the handle manufacturing module (150-250) comprises two bending heads (200), by means of which the ends of a rod element (S) are enclosed and are bent through substantially 90°, the bending heads have such a form that after insertion of the ends of a rod element (S) the inserted rod (S) is not in any direction capable of escaping through a single rotation of the bending head (200), the embodiment is additionally such that after the bending operation the ends of the rod element (S) can only be removed from the bending head (200) in the longitudinal direction of these ends.
10. An apparatus according to any of the preceding claims, **characterized in that** the rod feeding module (90-110) comprises a lifting apparatus (90) provided with a plurality of imbricated plate elements (100) substantially arranged in the vertical direction, which are each provided with a slightly inclined upper edge (105) on which a rod element (S) can rest, and which plate elements (100) are arranged for movement substantially in the vertical direction with respect to each other, such that in a first position an upper edge (105) of a relevant plate element (100) coincides with an upper edge (105') of a subjacent plate element (100'), while in a second position the upper edge (105) of the relevant plate element (100) coincides with an upper edge (105'') of a superjacent plate element (100'').
11. An apparatus according to at least claim 2, **characterized in that** the grip feeding module (120-140) comprises a lifting apparatus (120) provided with a plurality of imbricated plate elements (130) substantially arranged in the vertical direction, which

are each provided with a slightly inclined upper edge (135) on which a grip (G) can rest, which plate elements (130) are arranged for movement in the vertical direction with respect to each other, such that in a first position an upper edge (135) of a relevant plate element (130) coincides with an upper edge (135') of a subjacent plate element (130'), while in a second position the upper edge (135) of the relevant plate element (130) coincides with an upper edge (135'') of a superjacent plate element (130'').

12. An apparatus according to any of the preceding claims, **characterized in that** the bucket moving module (20-80) comprises a feeding conveyor (20), a lifting unit (30) arranged to lift a bucket (E) of the feeding conveyor (20), a supporting plate (40) arranged for movement in the horizontal direction, on which the lifting unit (30) places a lifted bucket (E), a rotatable centering plate (50) intended to be placed in the opening of the bucket (E), a stacking unit (70) for forming a stack of buckets (E) provided with handles, and an outlet conveyor (80) for carrying away a stack of buckets.
13. An apparatus according to any of the preceding claims, **characterized in that** the handle mounting module comprises two handle mounting heads (265) and a mechanism (266, 269) for moving the handle mounting heads (265) of the handle manufacturing module (150-250) to the bucket (E).
14. An apparatus according to claim 13, **characterized in that** each handle mounting head (265) comprises an outer cylinder (267) with a straight longitudinal groove and an inner cylinder (268) with a helical groove, rotatably included therein, so that rotation of the inner cylinder (268) with respect to the outer cylinder (267) effects an axial movement of an end of a bucket handle (H) received in the handle mounting module (265).

Patentansprüche

1. Vorrichtung mit einem Eimertransportmodul (20-80) zum Zuführen von henkellosen Eimern (E) und zum Abführen von mit Henkeln (H) versehenen Eimern (E), einem Griffherstellungsmodul (150-250) zum Herstellen von Henkeln (H) aus Metallstabelementen (S), einem Stabzuführmodul (90-110) zum Zuführen von Metallstabelementen (S) zum Henkelherstellungsmodul (150-250), und einem Henkelmontagemodul (260) zum Montieren eines Henkels (H) an einen henkellosen Eimer (E), wobei das Stangenzuführmodul (90-110) für das Zuführen unterschiedlich langer Stabelemente (S) einstellbar ist, wobei das Henkelherstellungsmodul

(150-250) für die Herstellung von Henkeln (H) verschiedener Abmessungen und/oder Formen einstellbar ist, und wobei das Eimertransportmodul (20-80) zum Zuführen und Abführen von Eimern (E) unterschiedlicher Abmessungen einstellbar ist.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** sie mit einem Griffzuführmodul (120-140) zum Zuführen von Griffen (G) zum Henkelherstellungsmodul (150-250) versehen ist.
3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, daß** das Griffzuführmodul (120-140) zum Zuführen verschiedener Arten von Griffen (G) einstellbar ist.
4. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Henkelherstellungsmodul (150-180) zwei Knaufbildungsköpfe (150, 160) aufweist, die einander gegenüberliegend angeordnet und jeweils um eine gemeinsame Drehachse drehbar sind sowie in Richtung der Drehachse axial bewegbar angeordnet sind, wobei die Knaufbildungsköpfe (150, 160) jeweils mit einem Knaufbildungselement (170) und wenigstens einem Stützelement (180) versehen sind, wobei das Knaufbildungselement (170) mit einer Formfläche (175) versehen ist, welche die Drehachse schneidet und einen Winkel mit der Drehachse bildet, während das wenigstens eine Stützelement (180) zur Anlage an der Außenfläche des Stangenelements (S) vorgesehen ist, um von der Formfläche (175) auf das Stangenelement (S) ausgeübte Kräfte aufzunehmen.
5. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Henkelherstellungsmodul (150-250) mit einer Biegeeinheit (190-250) versehen ist, mittels welcher das Stangenelement (S) zu einem Henkel (H) gebogen wird.
6. Vorrichtung nach Anspruch 5, **dadurch gekennzeichnet, daß** die Biegeeinheit (190-250) eine Entspannungsanordnung (220-250) aufweist, die der Durchführung mehrerer plastischer Verformungsvorgänge dient, welche keine definitive Verformung bewirken, sondern lediglich eine Entspannung der in dem gebogenen Stangenelement (S) infolge des Biegens des Stangenelements (S) durch die Biegeeinheit existierenden Spannungen.
7. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet, daß** die Entspannungsanordnung mehrere nebeneinanderliegende Anlageelemente (220) aufweist, die mit einem Aufnahmeschlitz (230) zum teilweisen Aufnehmen des gebogenen Stangenelements (S) versehen sind, wobei die Anlageelemen-

te (220) bewegbar angeordnet sind und jedes Anlageelement (220) mit einer Nockenbahnnut (240) versehen ist, wobei die Entspannungsanordnung mit wenigstens einem bewegbaren Nocken (250) versehen ist, der durch die Nockenbahnnuten (240) der nachfolgenden Anlageelemente bewegbar ist, und wobei der Nocken eine Bewegung wenigstens einer Anzahl der Anlageelemente (220) bewirkt.

8. Vorrichtung nach Anspruch 7, **dadurch gekennzeichnet, daß** die Vorrichtung mit mehreren Nocken (250) versehen ist, wobei die Anordnung aufeinanderfolgender Nocken (250) derart ist, daß die ersten entlanglaufenden Nocken (250) eine plastische Verformung der gebogenen Stange (S) bewirken, während die letzten entlanglaufenden Nocken im wesentlichen die Verformungen der gebogenen Stange (S) aufheben.
9. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Henkelherstellungsmodul (150-250) zwei Biegeköpfe (200) aufweist, mittels derer die Enden eines Stangenelements (S) umschlossen um im wesentlichen 90° gebogen werden, wobei die Biegeköpfe eine derartige Form haben, daß sich die eingesetzte Stange (S) nach Einsetzen der Enden eines Stangenelements (S) über eine einzelne Drehung des Biegekopfs (200) in keine Richtung lösen können, wobei die Ausführungsform ferner derart gestaltet ist, daß nach dem Biegevorgang die Enden des Stangenelements (S) nur in Längsrichtung dieser Enden aus dem Biegekopf (200) entnommen werden können.
10. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Stangenzuführmodul (90-110) eine Hebevorrichtung (90) mit mehreren im wesentlichen vertikal angeordneten verschachtelten Plattenelementen (100) aufweist, welche mit einem leicht geneigten oberen Rand (105) versehen sind, auf dem ein Stangenelement (S) aufliegen kann, und wobei die Plattenelemente (100) im wesentlichen vertikal zueinander bewegbar angeordnet sind, so daß in einer ersten Position ein oberer Rand (105) eines relevanten Plattenelements (100) mit einem oberen Rand (105') eines darunter liegenden Plattenelements (100'') zusammenfällt, während in einer zweiten Position der obere Rand (105) des jeweiligen Plattenelements (100) mit einem oberen Rand (105'') eines darüber liegenden Plattenelements (100'') zusammenfällt.
11. Vorrichtung nach wenigstens Anspruch 2, **dadurch gekennzeichnet, daß** das Griffzuführmodul (120-140) eine Hebevorrichtung (120) mit mehreren im wesentlichen vertikal angeordneten ver-

schachtelten Plattenelementen (130) aufweist, welche mit einem leicht geneigten oberen Rand (135) versehen sind, auf dem ein Griff (G) aufliegen kann, und wobei die Plattenelemente (130) im wesentlichen vertikal zueinander bewegbar angeordnet sind, so daß in einer ersten Position ein oberer Rand (135) eines relevanten Plattenelements (130) mit einem oberen Rand (135') eines darunter liegenden Plattenelements (130') zusammenfällt, während in einer zweiten Position der obere Rand (135) des jeweiligen Plattenelements (130) mit einem oberen Rand (135'') eines darüber liegenden Plattenelements (130'') zusammenfällt.

12. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Eimertransportmodul (20-80) aufweist: einen Zuführförderer (20), eine zum Heben eines Eimers (E) vom Zuführförderer (20) angeordnete Hebeeinheit (30), eine zum Bewegen in horizontaler Richtung ausgebildete Stützplatte (40) auf welche die Hebeeinheit (30) einen angehobenen Eimer (E) stellt, eine drehbare Zentrierplatte (50) zum Anordnen in der Öffnung des Eimers (E), eine Stapeleinheit (70) zur Bildung eines Stapels von mit Henkeln versehenen Eimern (E), und einen Ausgabeförderer (80) zum Abtransportieren eines Eimerstapels.
13. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** das Henkelmontagemodul zwei Henkelmontageköpfe (265) und einen Mechanismus (266, 269) zum Bewegen der Henkelmontageköpfe (265) des Henkelherstellungsmoduls (150-250) zum Eimer (E) aufweist.
14. Vorrichtung nach Anspruch 13, **dadurch gekennzeichnet, daß** jeder Henkelmontagekopf (265) einen äußeren Zylinder (267) mit einer geraden Längsnut und einen darin drehbar enthaltenen inneren Zylinder (268) mit einer schraubenlinienförmigen Nut aufweist, so daß eine Drehung des inneren Zylinders (268) in bezug auf den äußeren Zylinder (267) eine axiale Bewegung eines Endes eines im Henkeltransportmodul (265) aufgenommenen Eimerhenkels (H) bewirkt.

Revendications

1. Appareil comportant un module de déplacement de seaux (20-80) destiné à faire avancer des seaux (E) sans anse et à transporter vers l'extérieur des seaux (E) munis d'anses (H), un module (150-250) de fabrication d'anses (H) à partir d'éléments (S) de tige métallique, un module (90-110) d'avance de tiges destiné à faire avancer les éléments (S) de tige métallique vers le module de fabrication d'anses (150-250), et un module de montage d'anse (260)

destiné à monter une anse (H) sur un seau sans anse (E), le module d'avance de tiges (90-110) étant réglable pour l'avance d'éléments de tige (S) de longueurs différentes, le module de fabrication d'anses (150-250) étant réglable pour la fabrication d'anses (H) de dimensions et/ou formes différentes, et un module de déplacement de seaux (20-80) étant réglable afin qu'il fasse avancer et transporte à distance des seaux (E) de dimensions différentes.

2. Appareil selon la revendication 1, **caractérisé en ce qu'il** est muni d'un module (120-140) d'avance de poignées destiné à faire avancer des poignées (G) vers le module de fabrication d'anses (150-250)
3. Appareil selon la revendication 2, **caractérisé en ce que** le module d'avance de poignées (120-140) est réglable pour l'avance de différents types de poignées (G).
4. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le module de fabrication d'anses (150-180) comprend deux têtes (150, 160) de formation de boutons qui sont placées l'une en face de l'autre, peuvent tourner chacune autour d'un axe commun de rotation et sont destinées à assurer un déplacement axial dans la direction de l'axe de rotation, les têtes (150, 160) de formation de bouton ayant chacune un élément (170) de formation de boutons et au moins un élément de support (180), l'élément de formation de bouton (170) est muni d'une surface de mise en forme (175) qui recoupe l'axe de rotation et forme un angle avec l'axe de rotation, alors que l'élément de support au moins (180) est destiné à être mis en butée contre la surface externe de l'élément de tige (S) pour l'encaissement des forces appliquées à l'extrémité de tige par la surface de mise en forme (175).
5. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le module de fabrication d'anses (150-250) a une unité de cintrage (190-250) grâce à laquelle l'élément de tige (S) est cintré sous forme d'une anse (H).
6. Appareil selon la revendication 5, **caractérisé en ce que** l'unité de cintrage (190-250) comporte un arrangement de relaxation (220-250) destiné à exécuter plusieurs opérations de déformation plastique, les opérations de déformation n'effectuant aucune déformation définitive mais assurant simplement une relaxation des contraintes existant dans l'élément de tige cintré (S) à la suite du cintrage de l'élément de tige (S) exécuté par l'unité de cintrage.
7. Appareil selon la revendication 6, **caractérisé en ce que** l'arrangement de relaxation comprend plu-

sieurs éléments juxtaposés de butée (220) qui sont munis d'une fente de logement (230) destinée à loger partiellement l'élément de tige cintré (S), les éléments de butée (220) sont disposés afin qu'ils soient mobiles, chaque élément de butée (220) est muni d'une gorge (240) formant un trajet de came, l'arrangement de relaxation est muni d'au moins une came mobile (250) qui peut se déplacer dans les gorges (240) des trajets de came des éléments successifs de butée, et la came impose un déplacement à au moins un certain nombre d'éléments de butée (220).

8. Appareil selon la revendication 7, **caractérisé en ce que** l'appareil est muni de plusieurs comes (250), l'arrangement des comes successives (250) est tel que les premières comes (250) qui se déplacent imposent une déformation plastique à la tige cintrée (S), alors que les dernières comes qui se déplacent suppriment pratiquement les déformations imposées à la tige cintrée (S).

9. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le module de fabrication d'anses (150-250) comporte deux têtes de cintrage (200) grâce auxquelles les extrémités d'un élément de tige (S) sont enfermées et sont cintrées de 90° pratiquement, les têtes de cintrage ont une forme telle que, après l'insertion des extrémités d'un élément de tige (S), la tige insérée (S) ne se trouve pas dans une direction telle qu'elle peut s'échapper par une simple rotation de la tête de cintrage (200), et le mode de réalisation est en outre tel que, après l'opération de cintrage, les extrémités de l'élément de tige (S) ne peuvent être retirées de la tête de cintrage (200) que dans la direction longitudinale de ses extrémités.

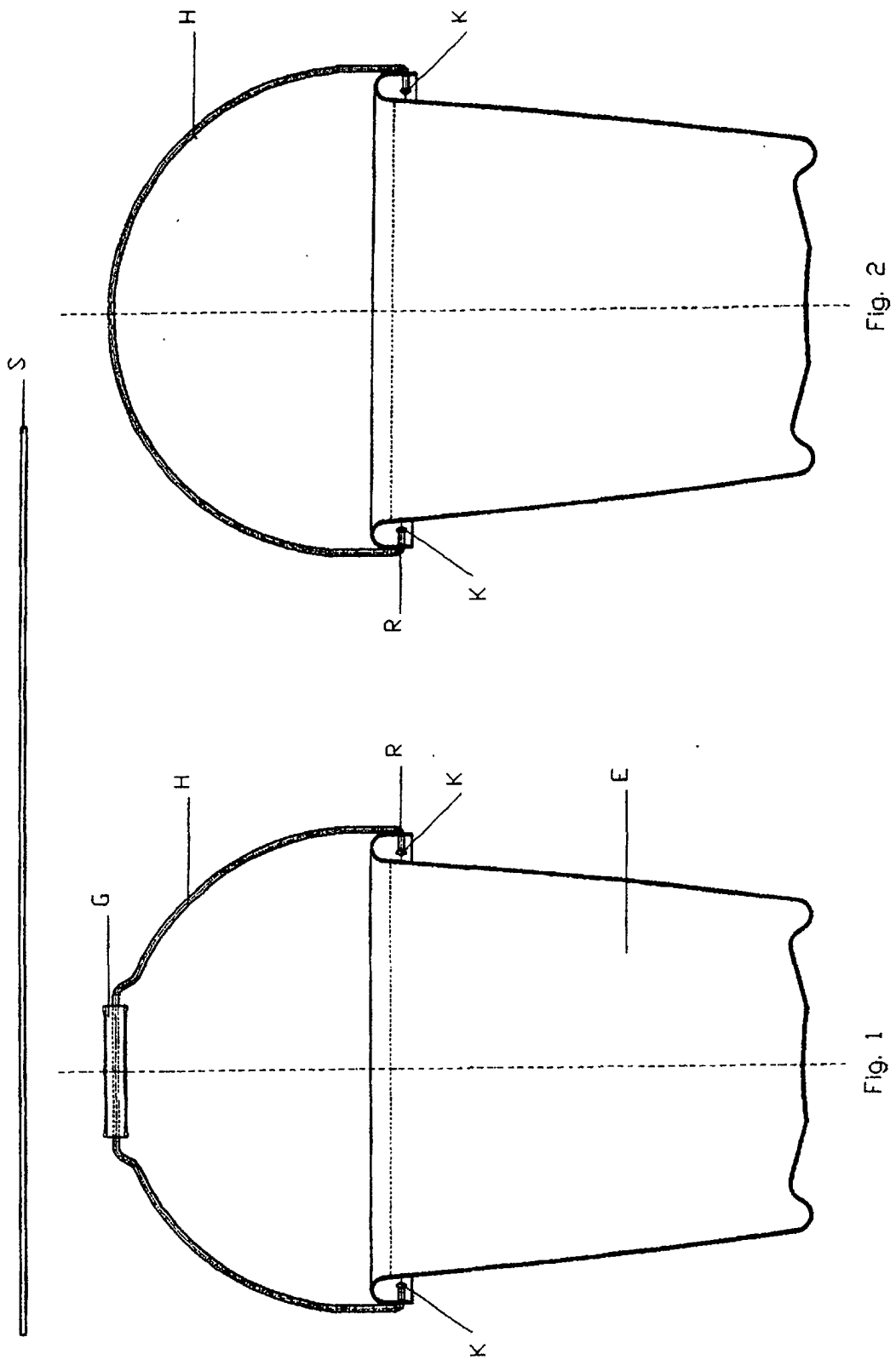
10. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le module d'avance de tiges (90-110) comporte un élément de soulèvement (90) ayant plusieurs éléments imbriqués de plaque (100) disposés pratiquement en direction verticale, qui sont munis chacun d'un bord supérieur légèrement incliné (105) sur lequel un élément de tige (S) peut reposer, les éléments de plaque (100) étant disposés afin qu'ils puissent se déplacer pratiquement en direction verticale les uns par rapport aux autres si bien que, dans une première position, un bord supérieur (105) d'un élément de plaque correspondant (100) coïncide avec un bord supérieur (105') d'un élément de plaque disposé au-dessous (100'), alors que, dans une seconde position, le bord supérieur (105) de l'élément de plaque concerné (100) coïncide avec le bord supérieur (105'') d'un élément de plaque disposé au-dessus (100'').

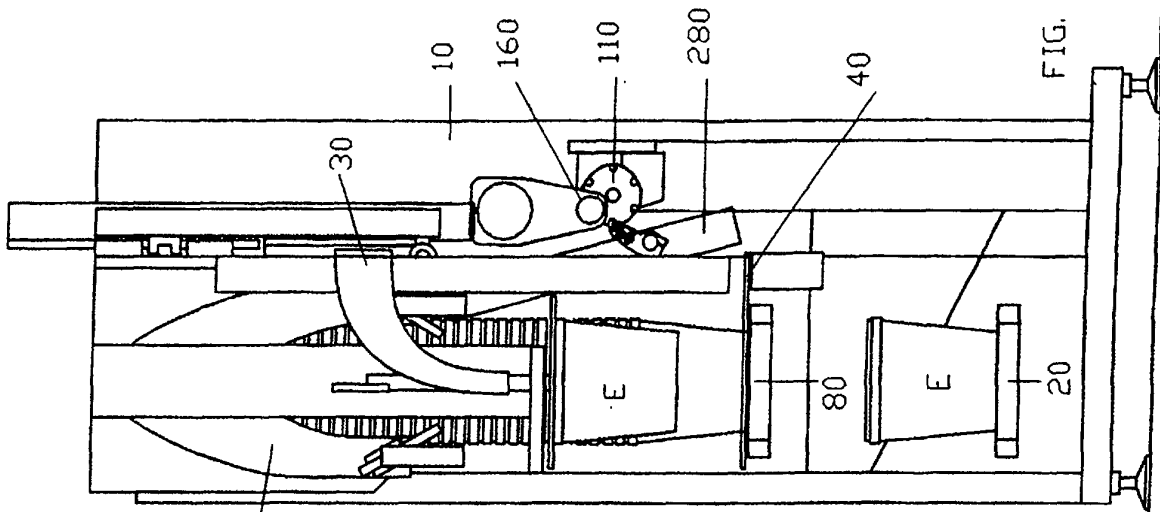
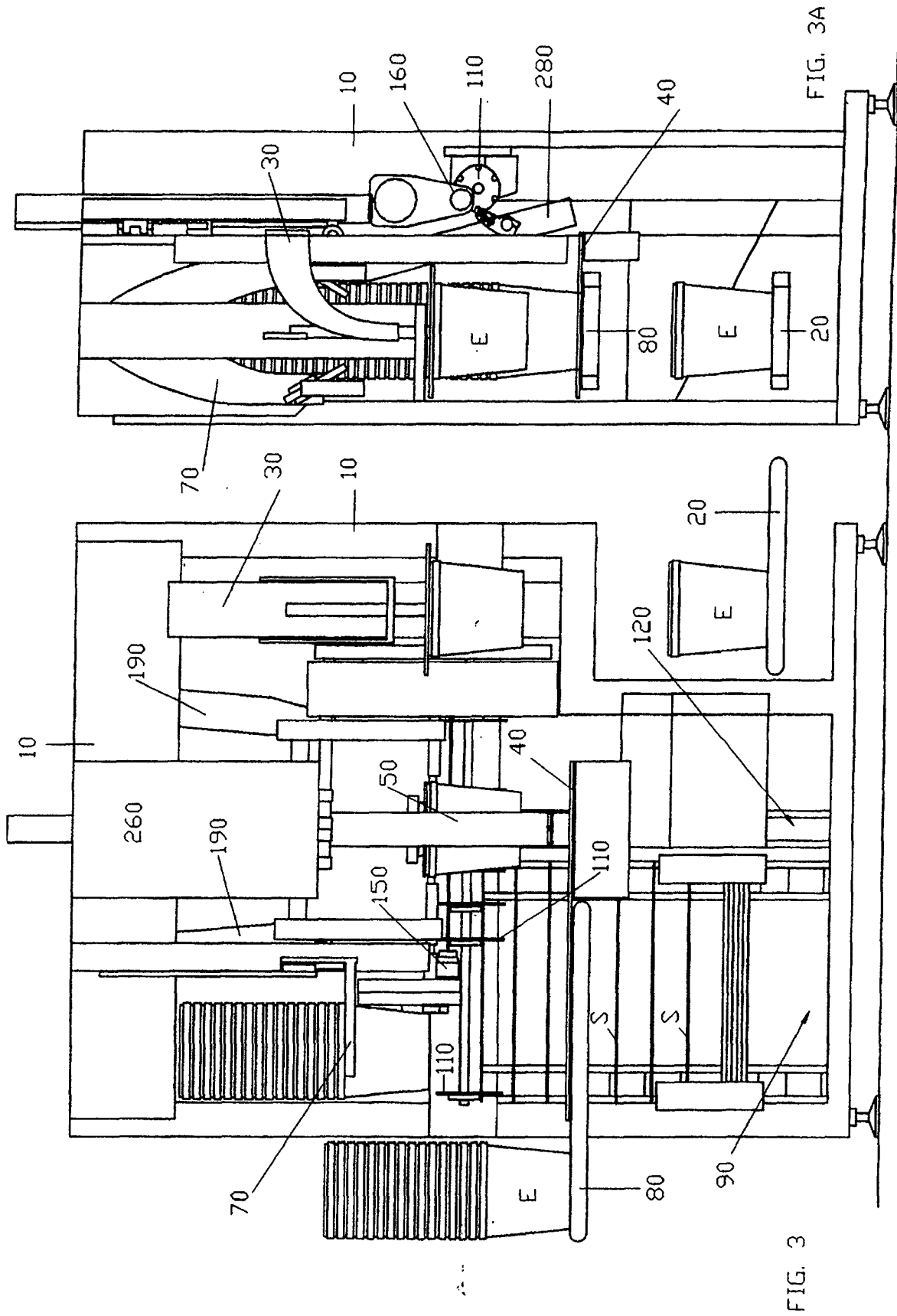
11. Appareil selon la revendication 2 au moins, **caractérisé en ce que** le module d'avance de poignées (120-140) comprend un appareil de soulèvement (120) muni de plusieurs éléments de plaque imbriqués (130) disposés pratiquement en direction verticale et qui sont munis chacun d'un bord supérieur légèrement incliné (135) sur lequel peut reposer une poignée (G), les éléments de plaque (130) étant disposés afin qu'ils se déplacent en direction verticale les uns par rapport aux autres si bien que, dans une première position, un bord supérieur (135) d'un élément de plaque correspondant (130) coïncide avec un bord supérieur (135') d'un élément de plaque placé au-dessous (130') alors que, dans une seconde position, le bord supérieur (135) de l'élément de plaque correspondant (130) coïncide avec un bord supérieur (135'') d'un élément de plaque placé au-dessus (130'').

12. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le module de déplacement de seaux (20-80) comprend un transporteur d'avance (20), une unité de soulèvement (30) destinée à soulever un seau (E) du transporteur d'avance (20), une plaque de support (40) destinée à se déplacer en direction horizontale et sur laquelle l'élément de soulèvement (30) place un seau soulevé (E), une plaque rotative de centrage (50) destinée à être placée dans l'ouverture du seau (E), une unité d'empilement (70) destinée à former un empilement de seaux (E) ayant les anses, et un transporteur de sortie (80) destiné à transporter à distance un empilement de seaux.

13. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le module de montage d'anse comporte deux têtes (265) de montage d'anse et un mécanisme (266, 269) destiné à déplacer les têtes de montage d'anse (265) du module de fabrication d'anses (150-250) vers le seau (E).

14. Appareil selon la revendication 13, **caractérisé en ce que** chaque tête de montage d'anse (265) comporte un cylindre externe (267) ayant une gorge longitudinale rectiligne et un cylindre interne (268) ayant une gorge hélicoïdale, incorporé afin qu'il puisse tourner à l'intérieur, si bien que la rotation du cylindre interne (268) par rapport au cylindre externe (267) provoque un déplacement axial d'une extrémité d'une anse (H) de seau logée dans le module de montage d'anse (265).





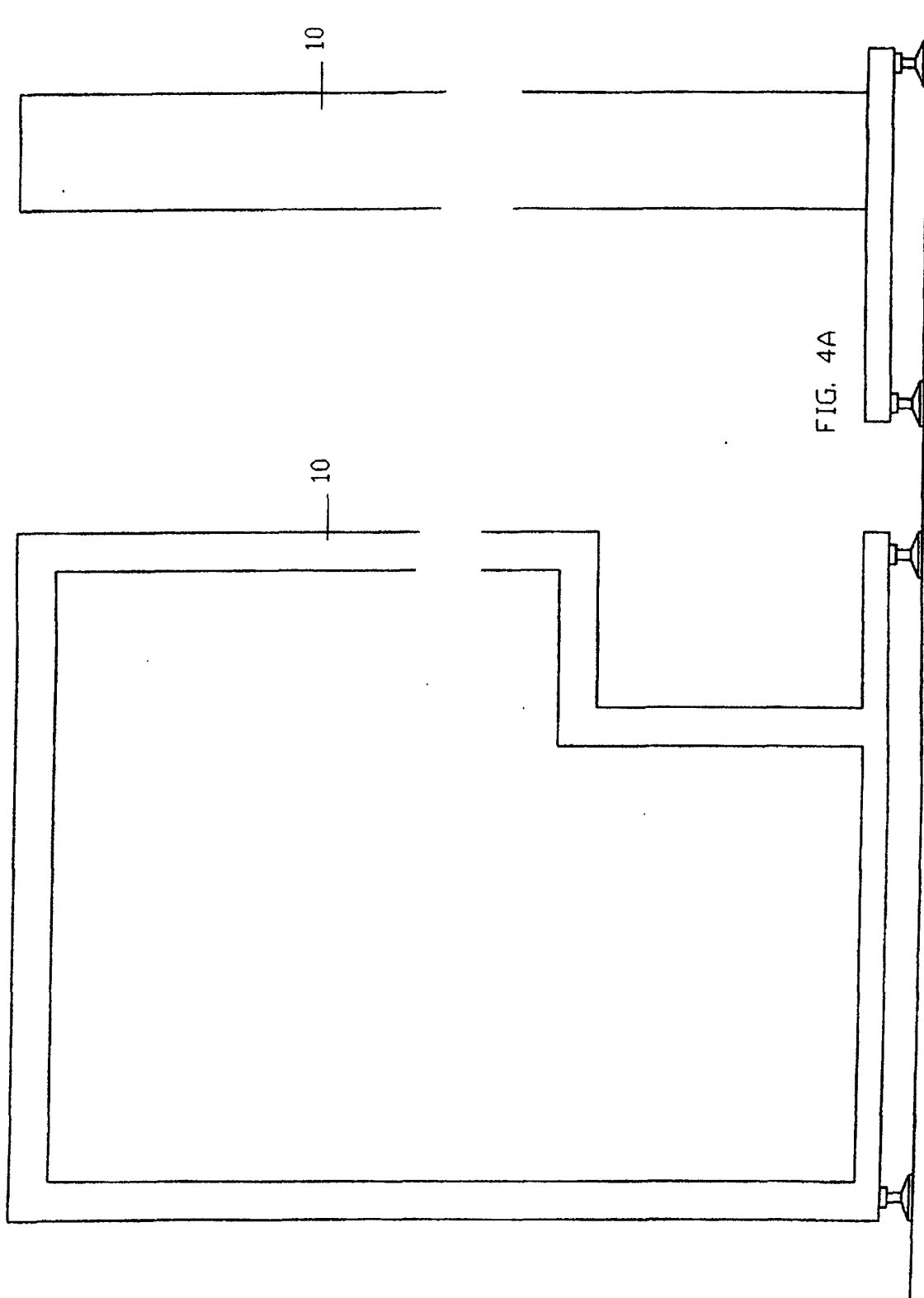
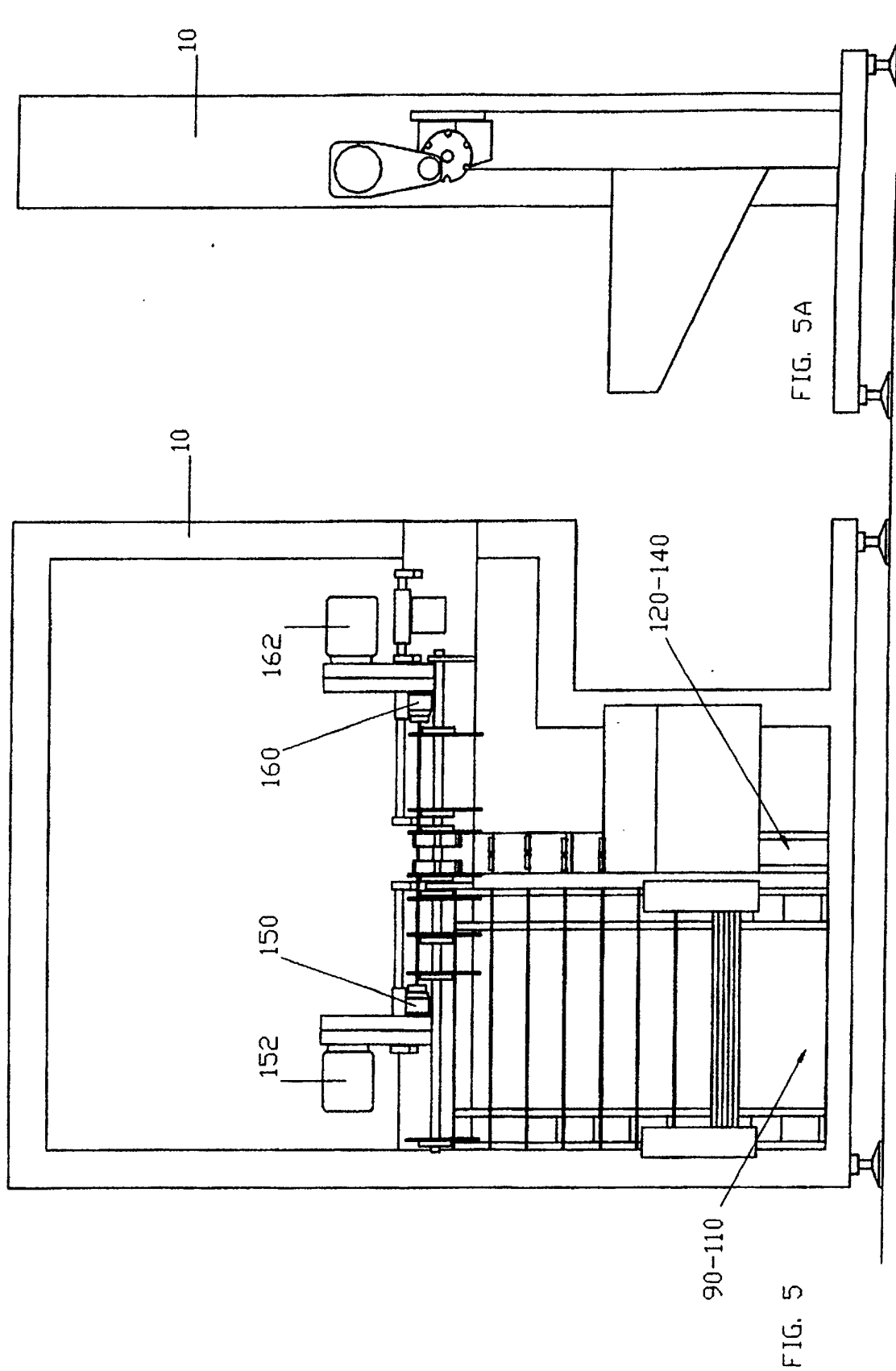


FIG. 4

FIG. 4A



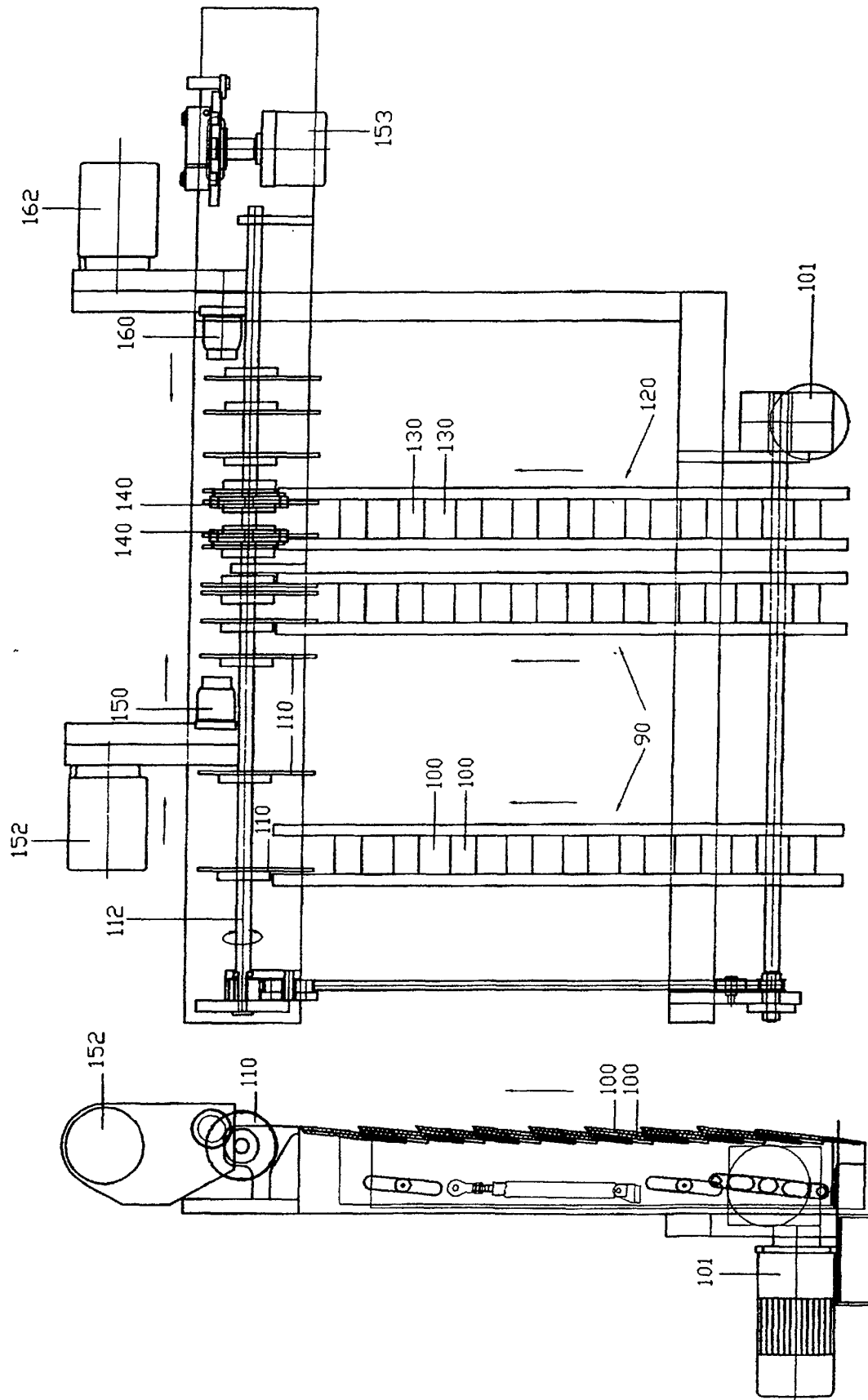


Fig. 6

Fig. 6A

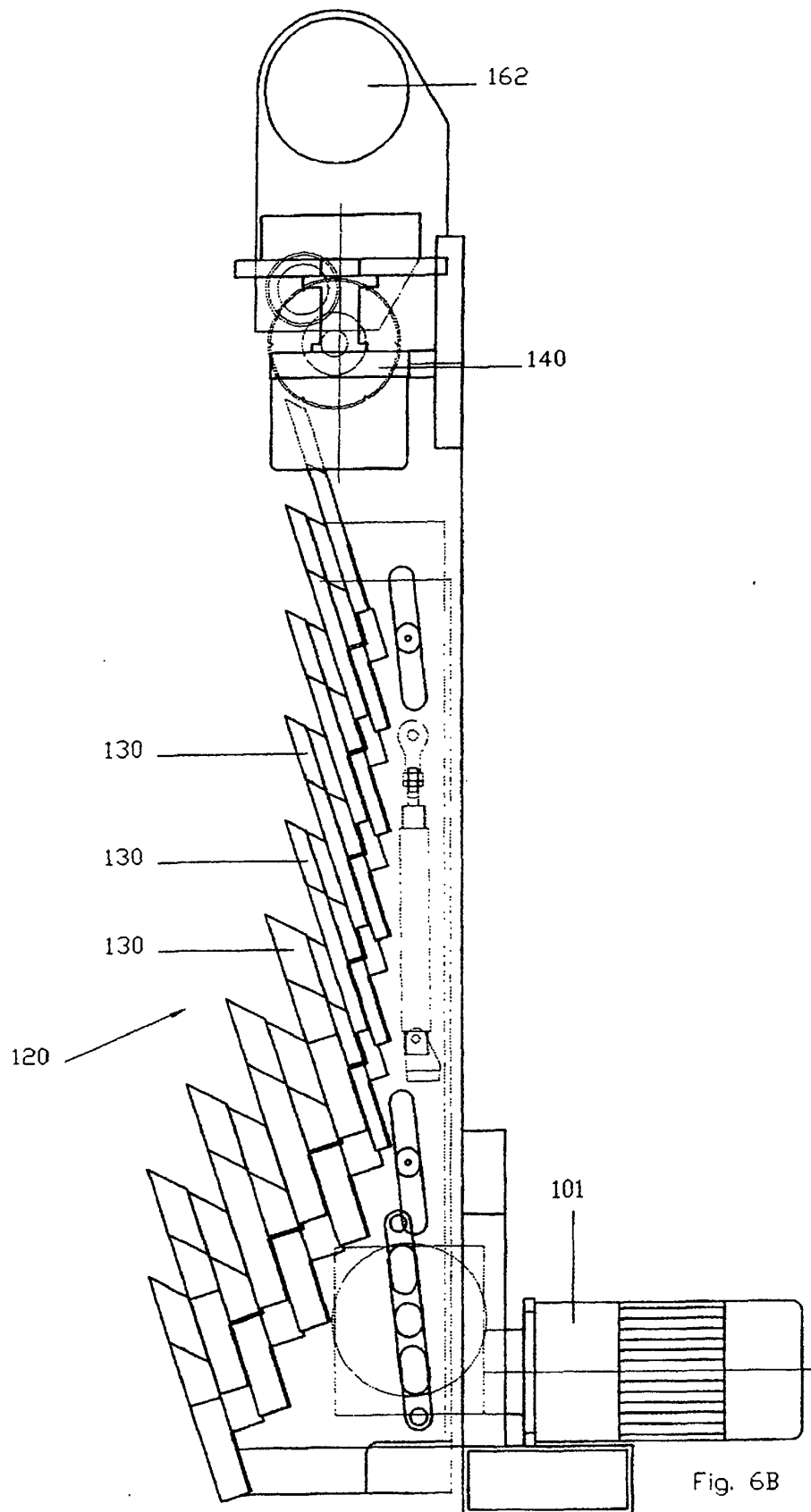


Fig. 6B

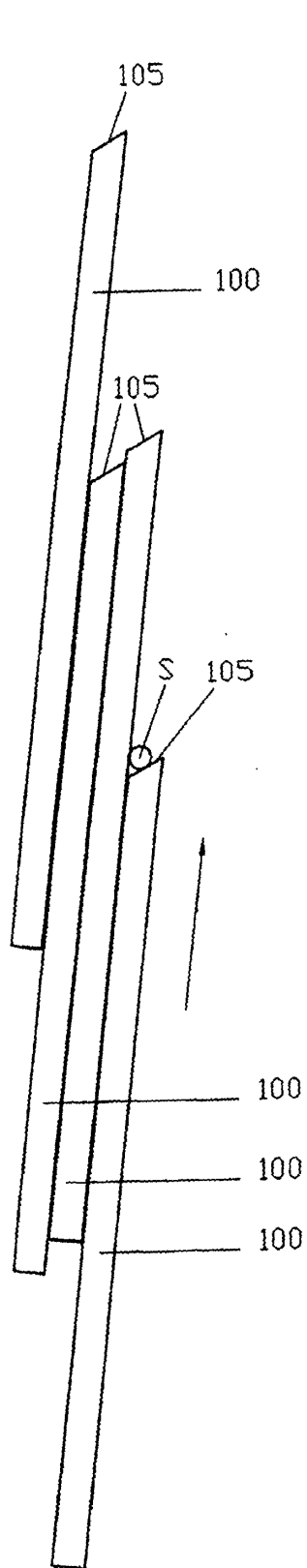


Fig. 7A

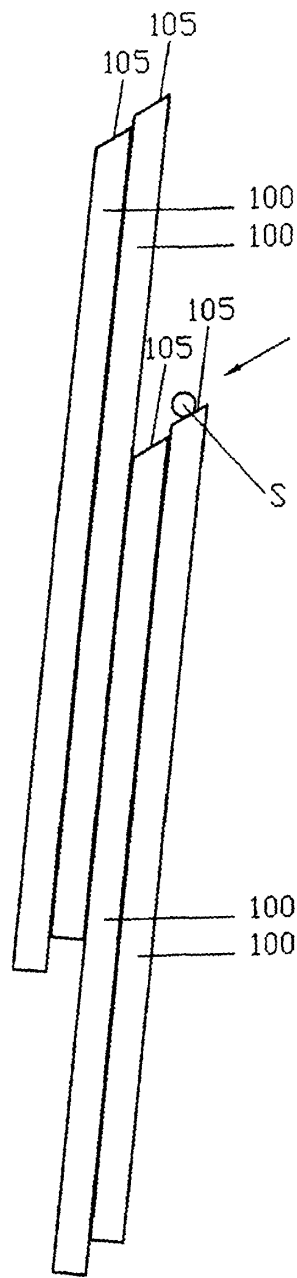


Fig. 7B

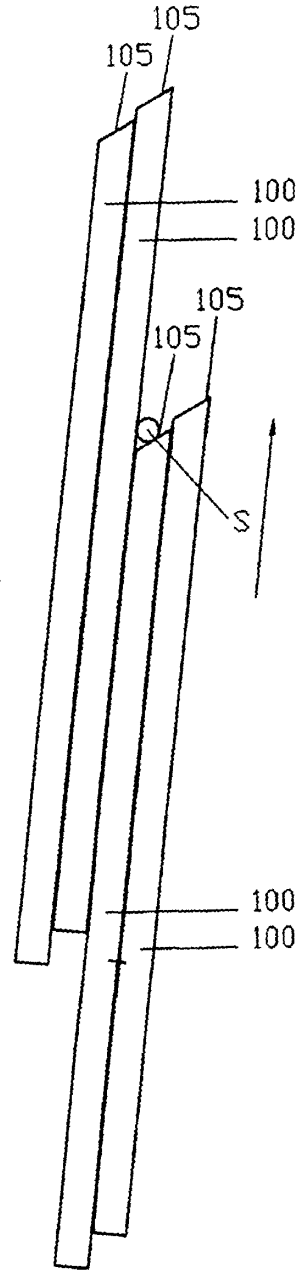


Fig. 7C

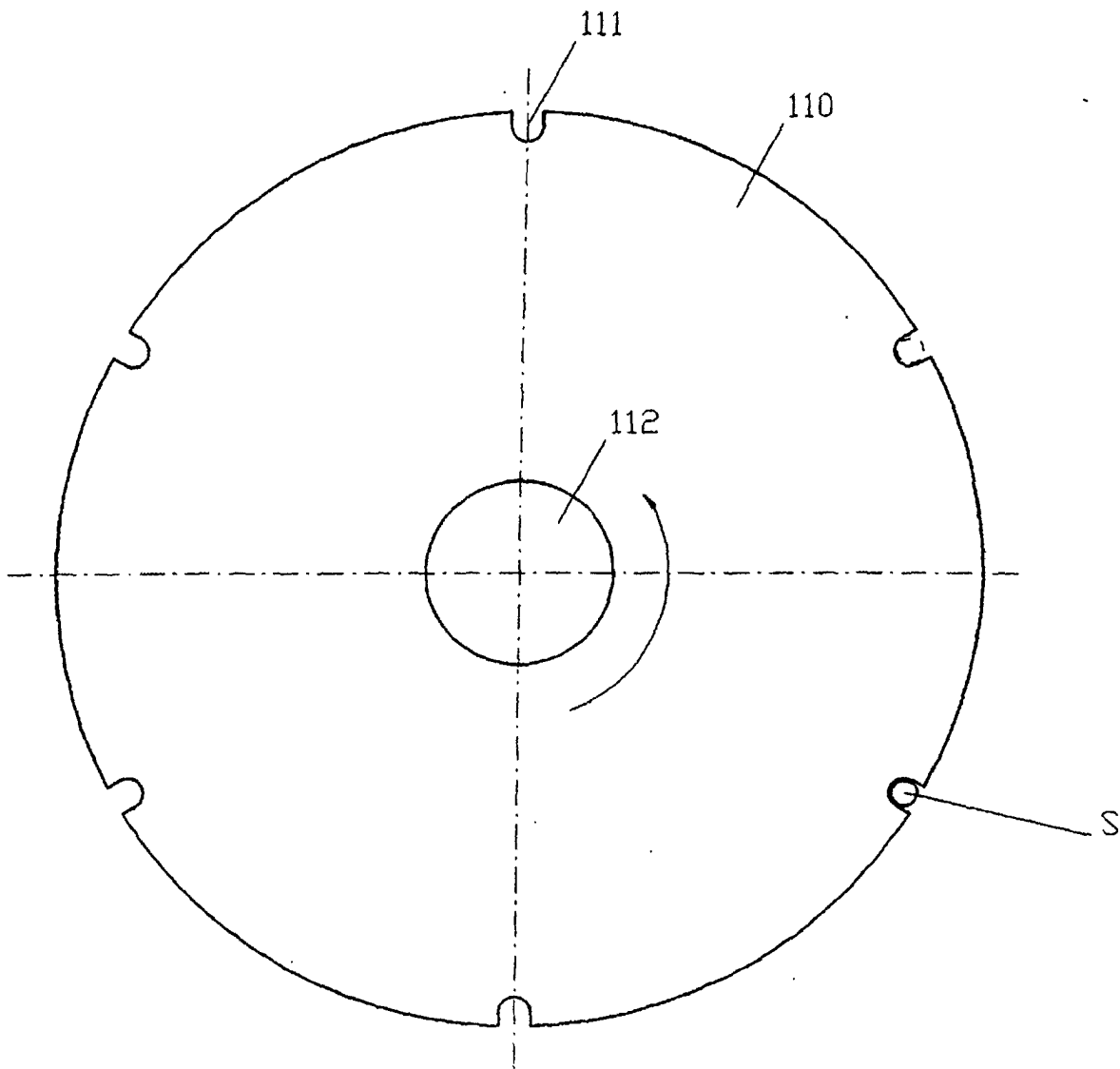
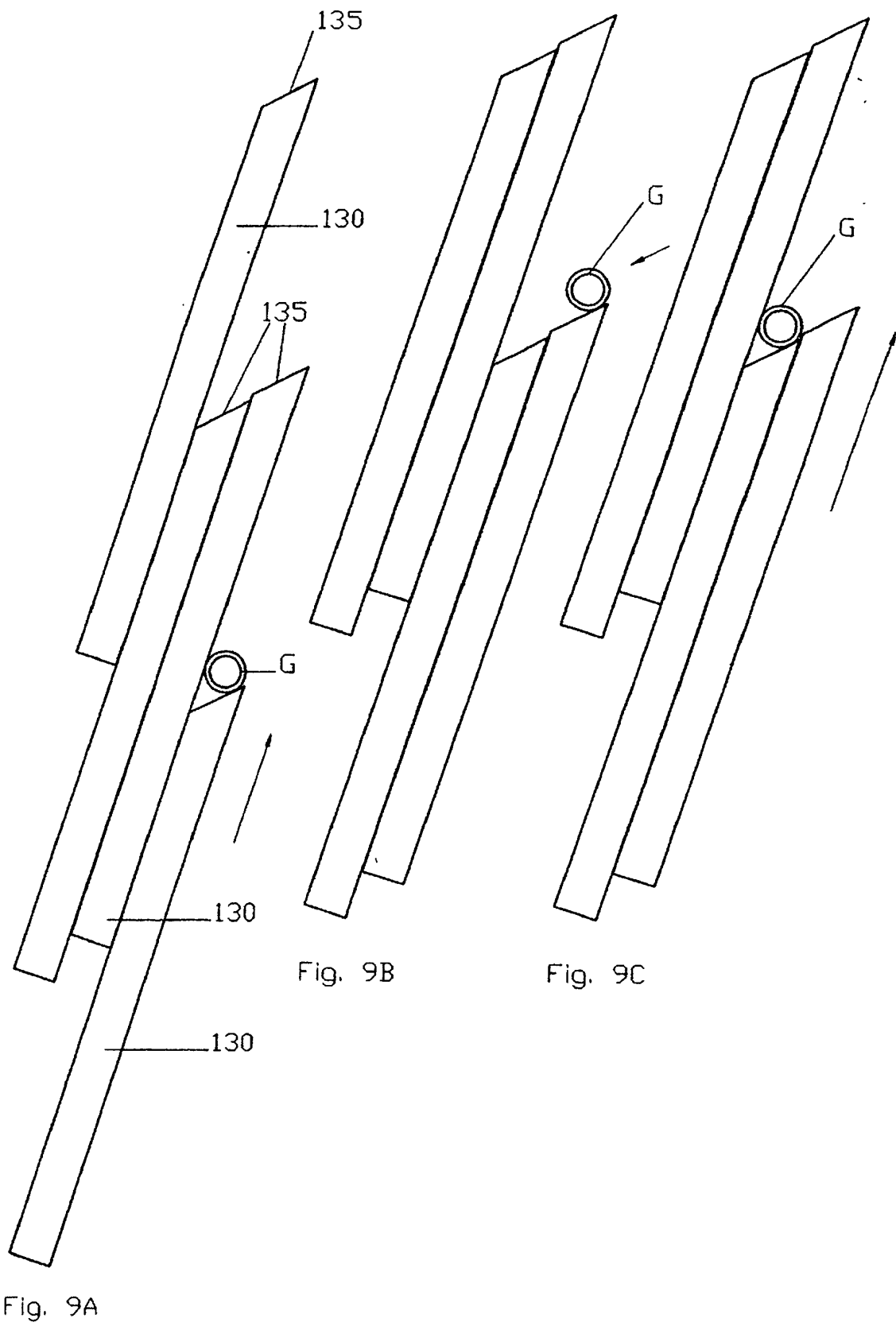


Fig. 8



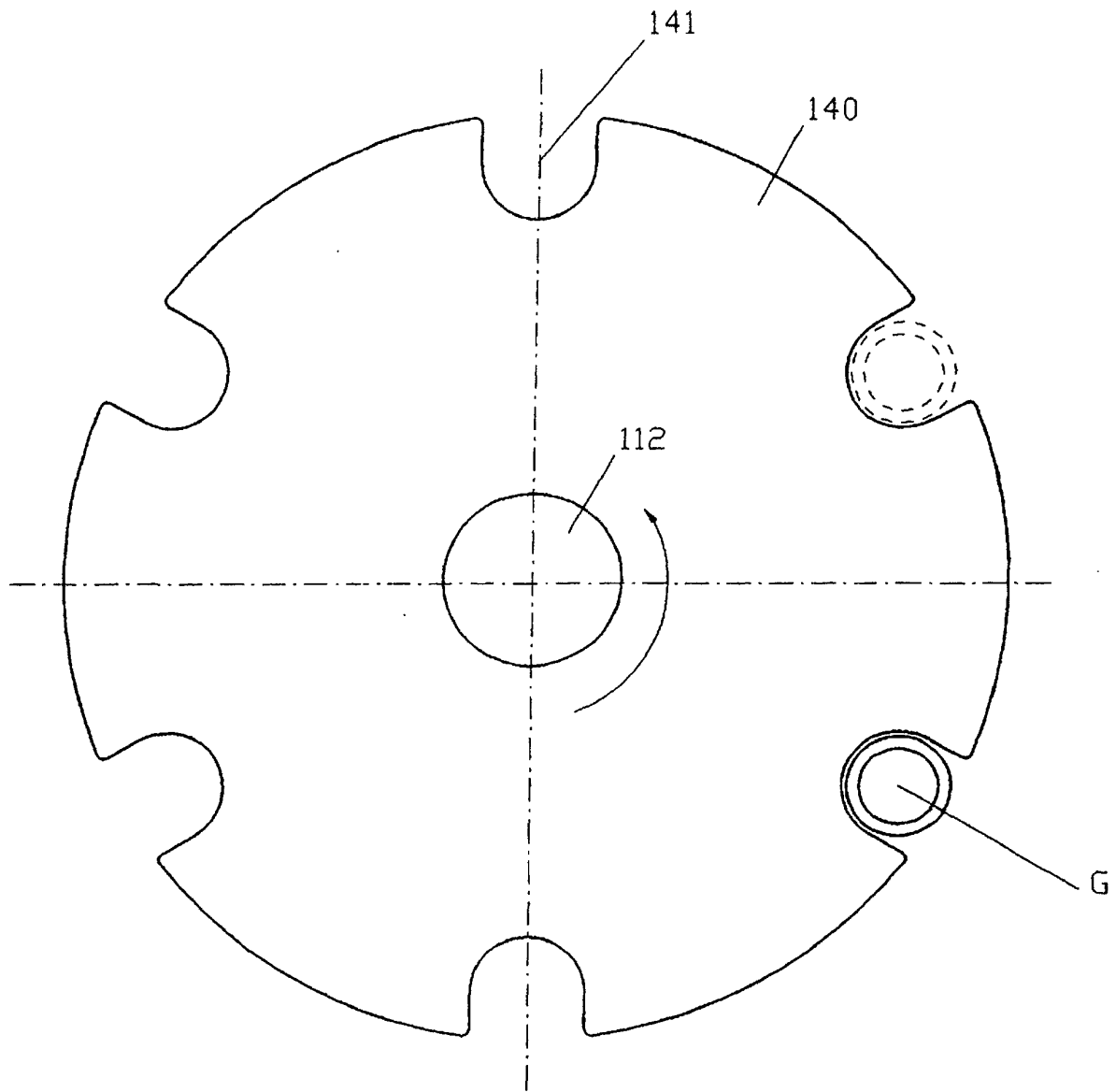


Fig. 10

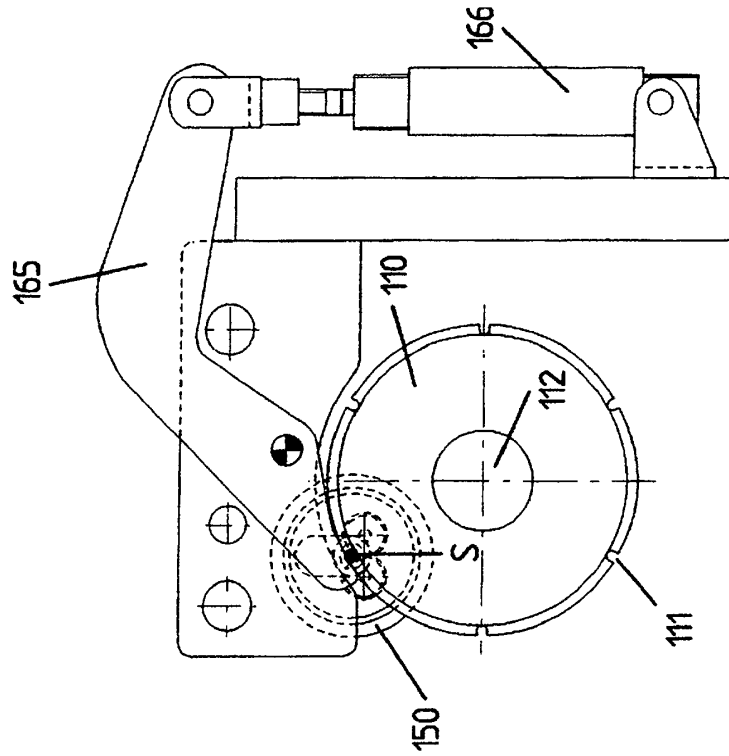


Fig. 11A

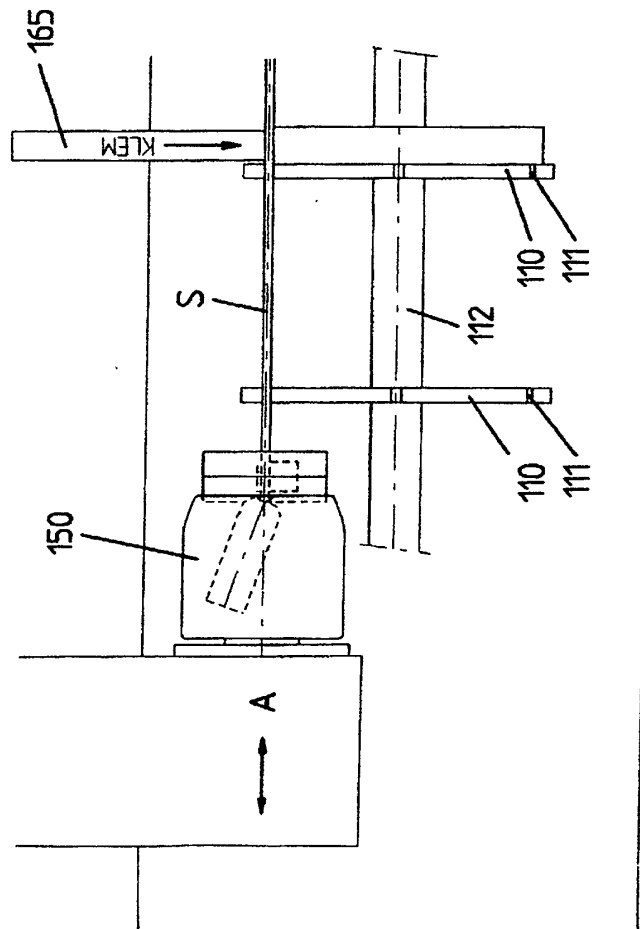


Fig. 11

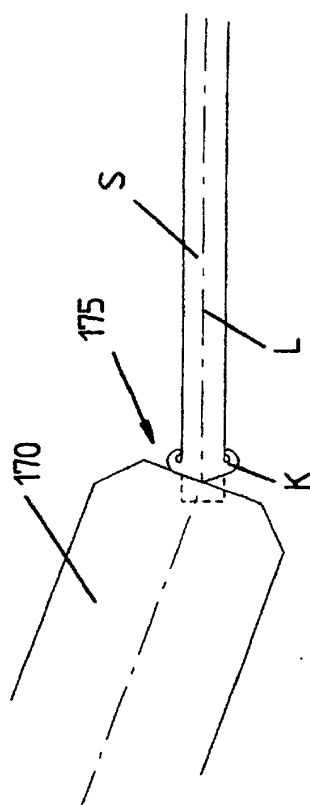


Fig. 13

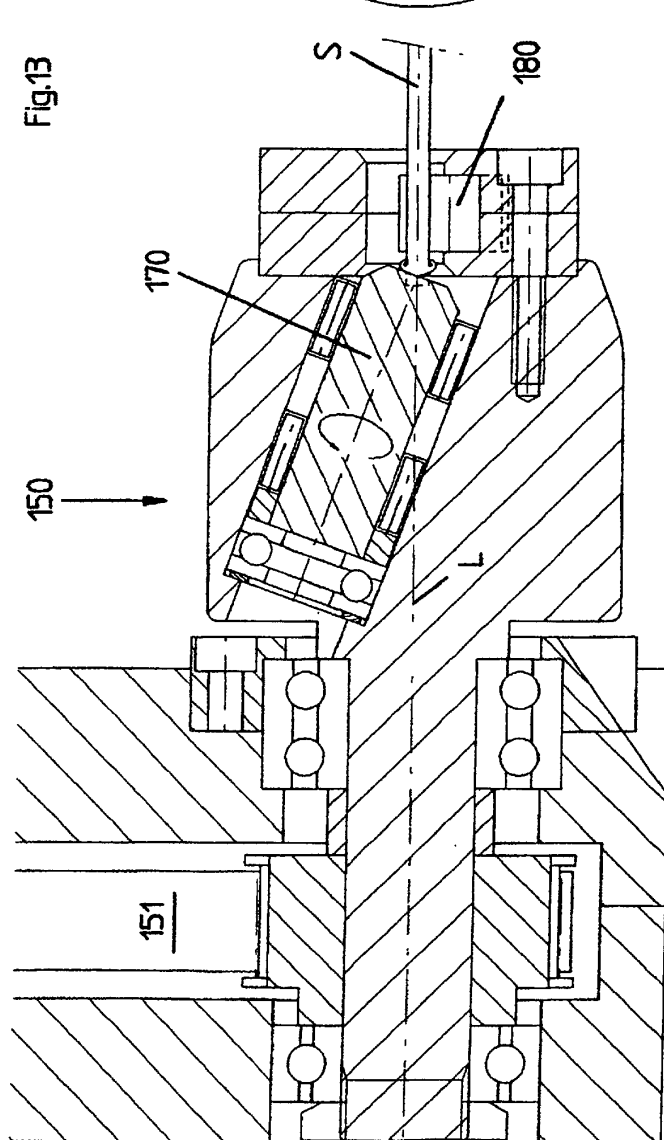


Fig. 12

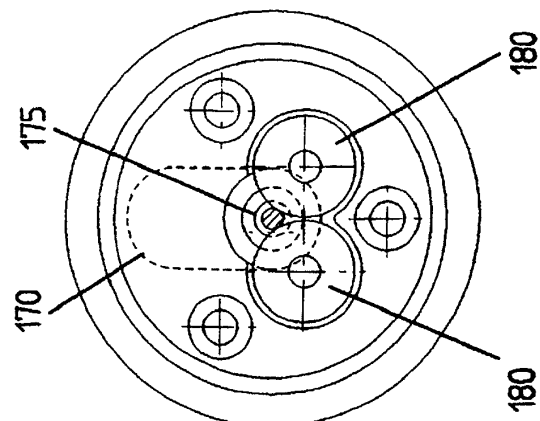


Fig. 12A

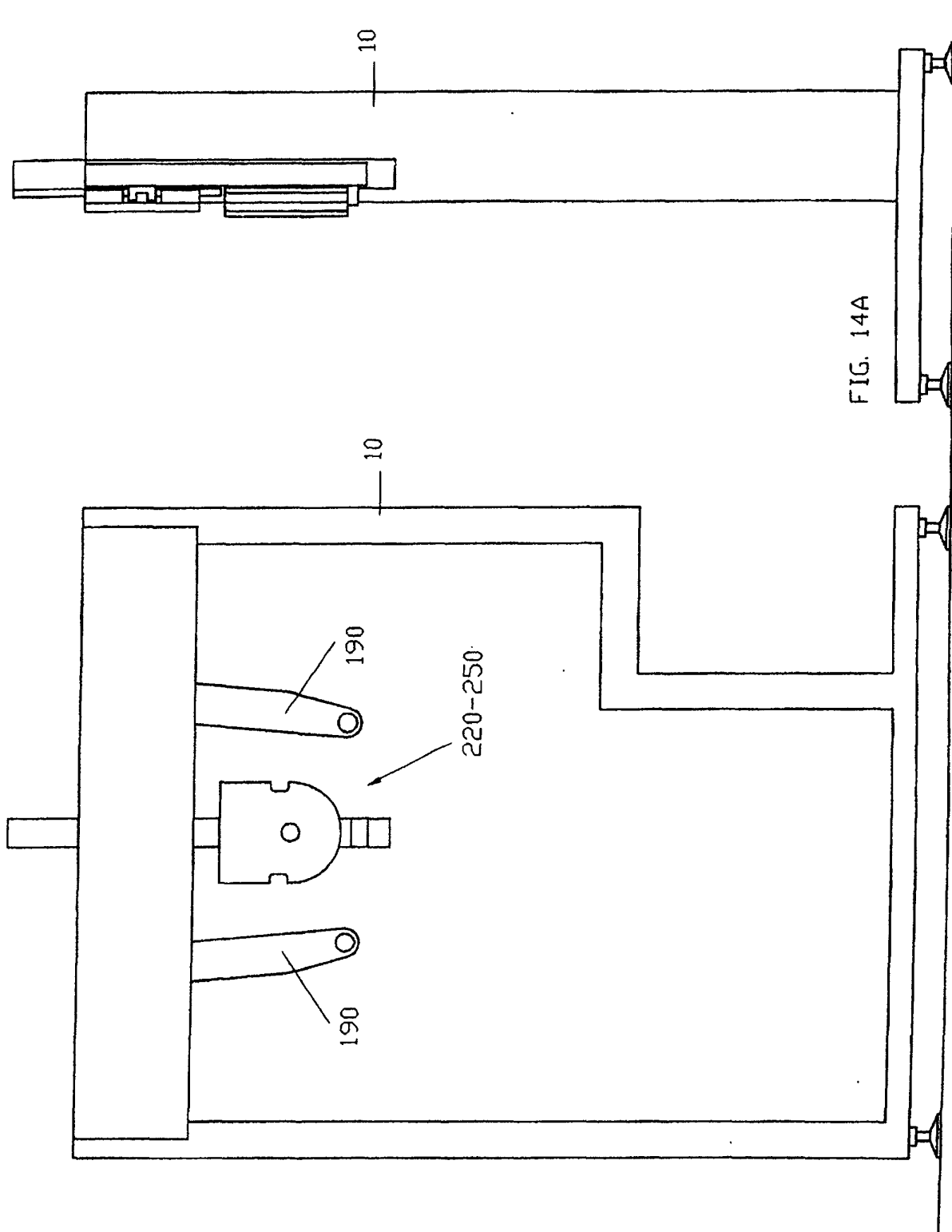
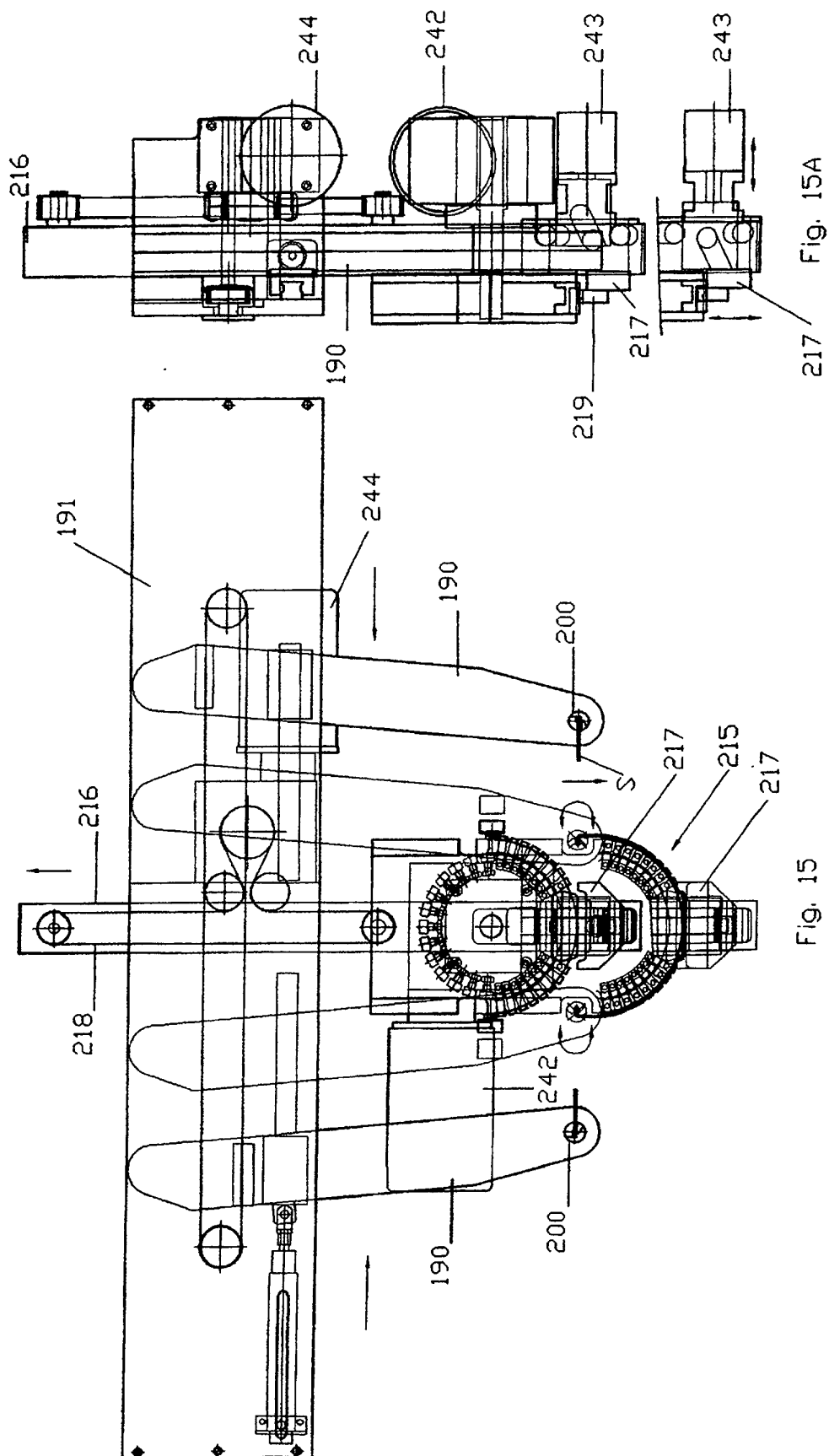
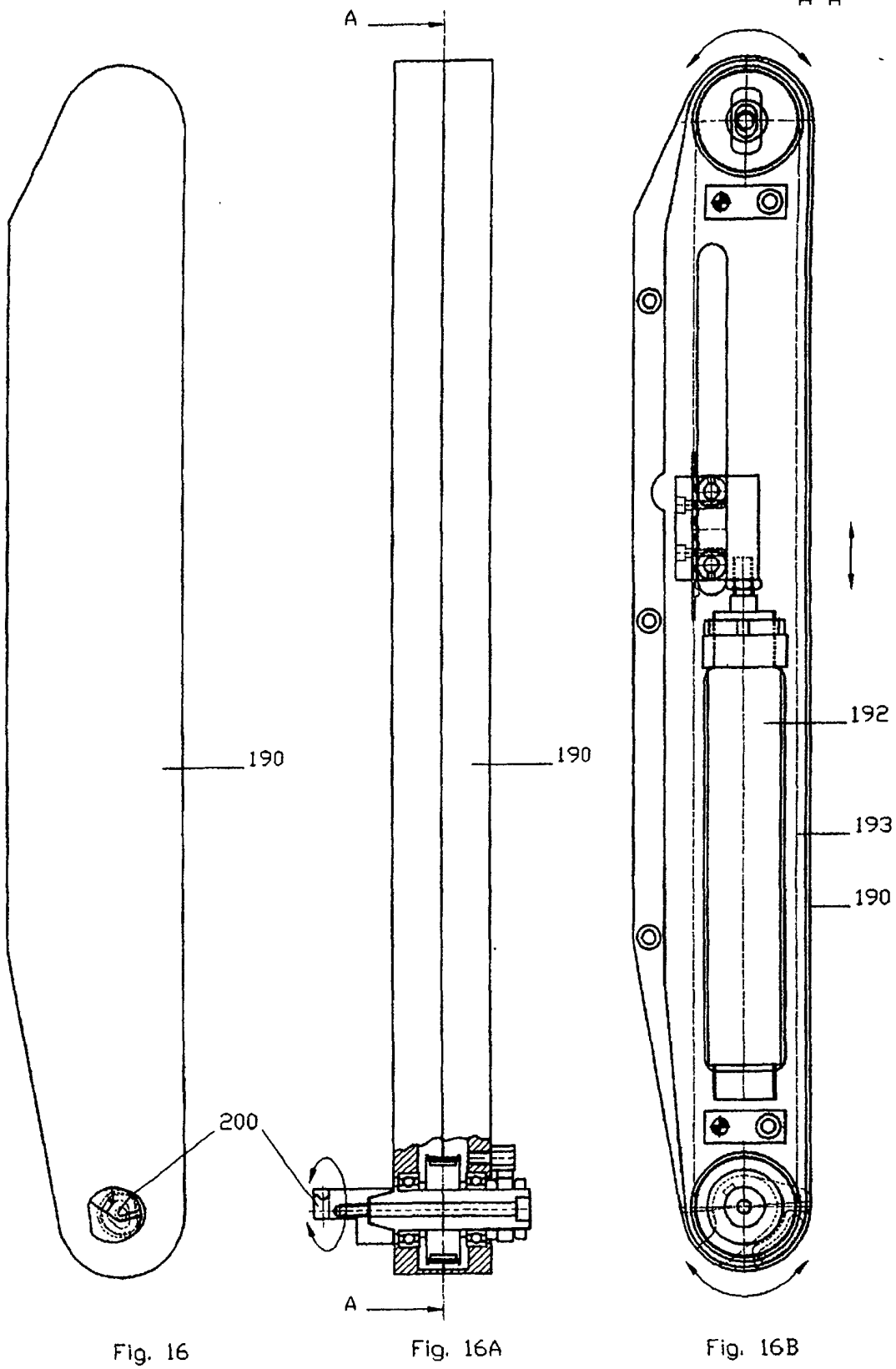
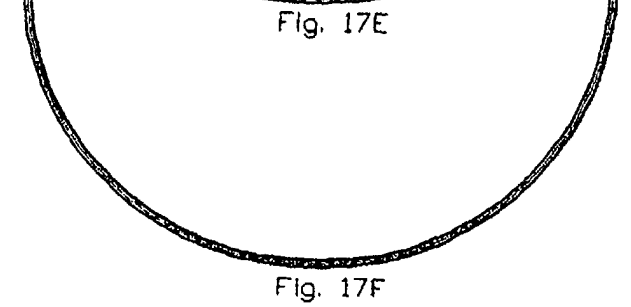
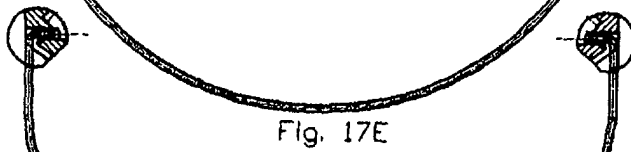
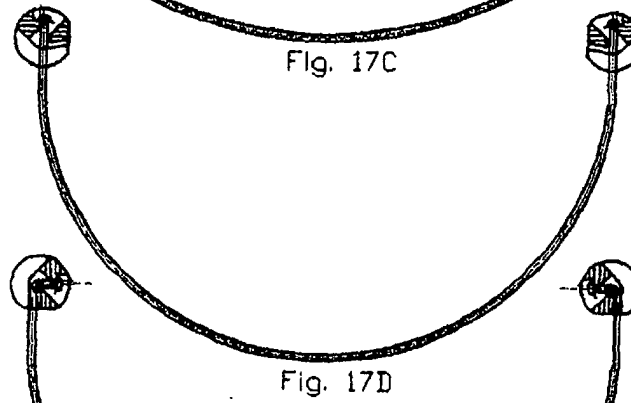
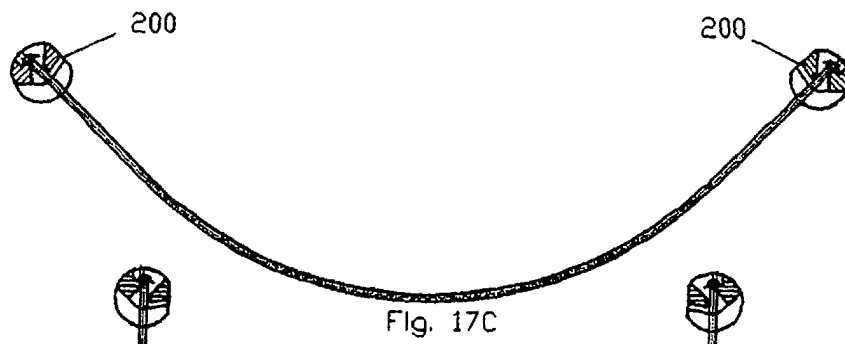
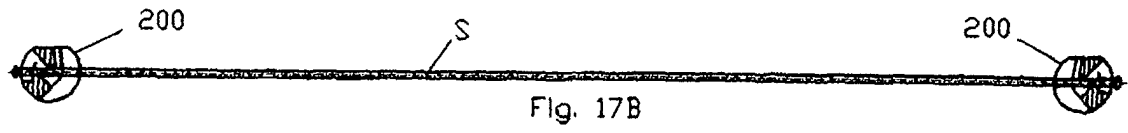
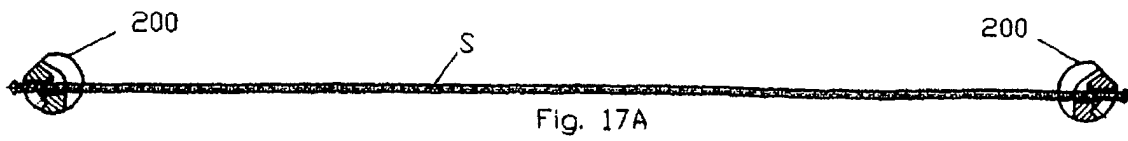


FIG. 14A

FIG. 14







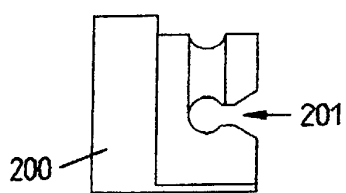


Fig. 17i

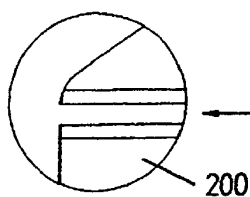


Fig. 17g

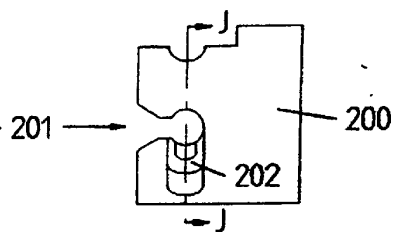


Fig. 17h

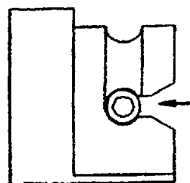


Fig. 17L1

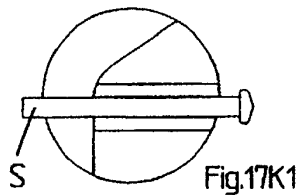


Fig. 17K1

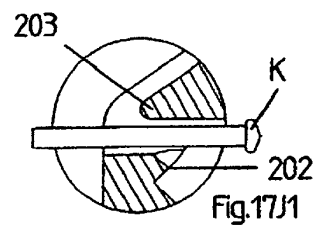


Fig. 17J1

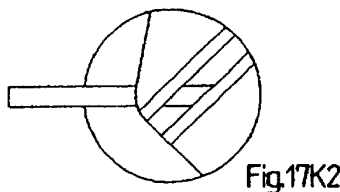


Fig. 17K2

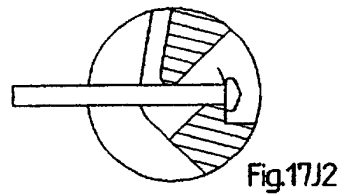


Fig. 17J2

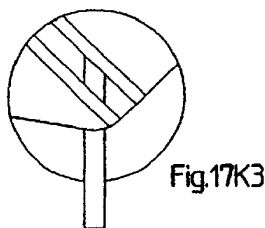


Fig. 17K3

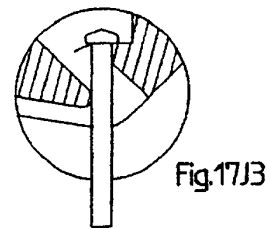


Fig. 17J3

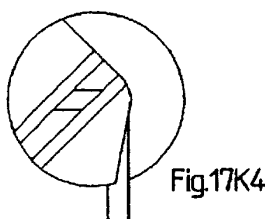


Fig. 17K4

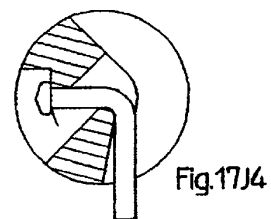


Fig. 17J4

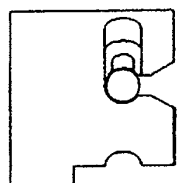


Fig. 17L5

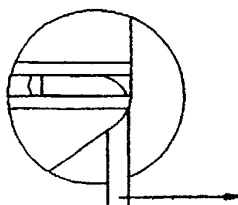


Fig. 17K5

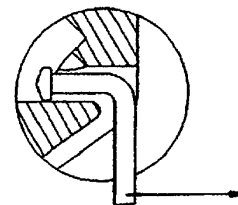
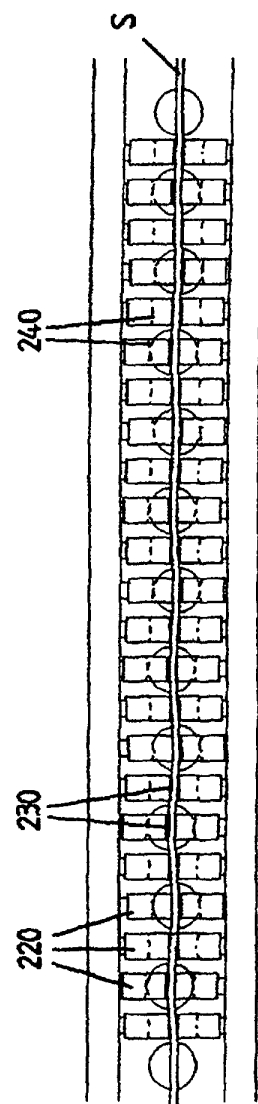
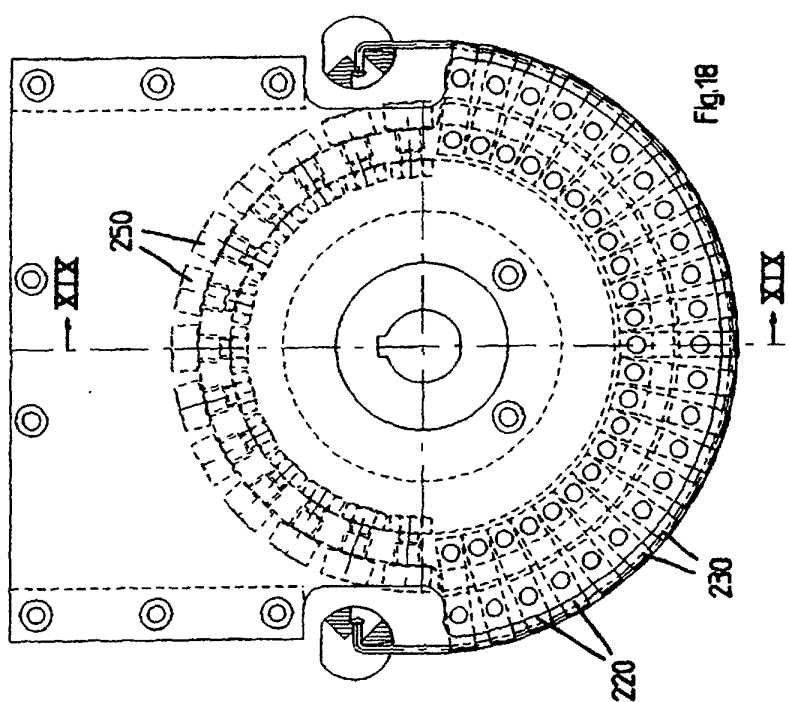
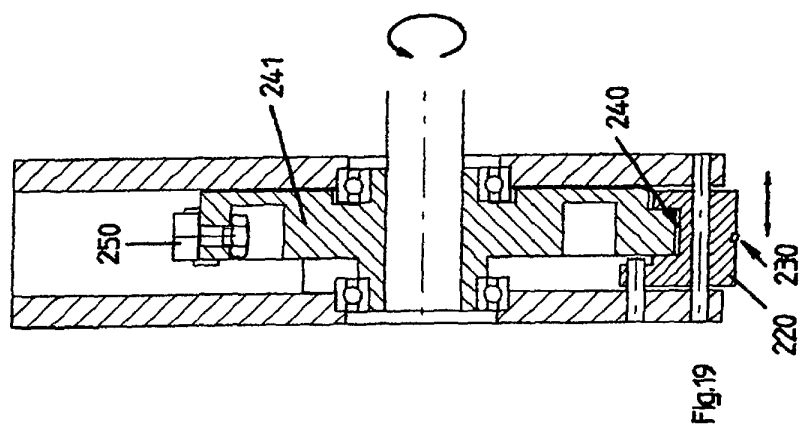
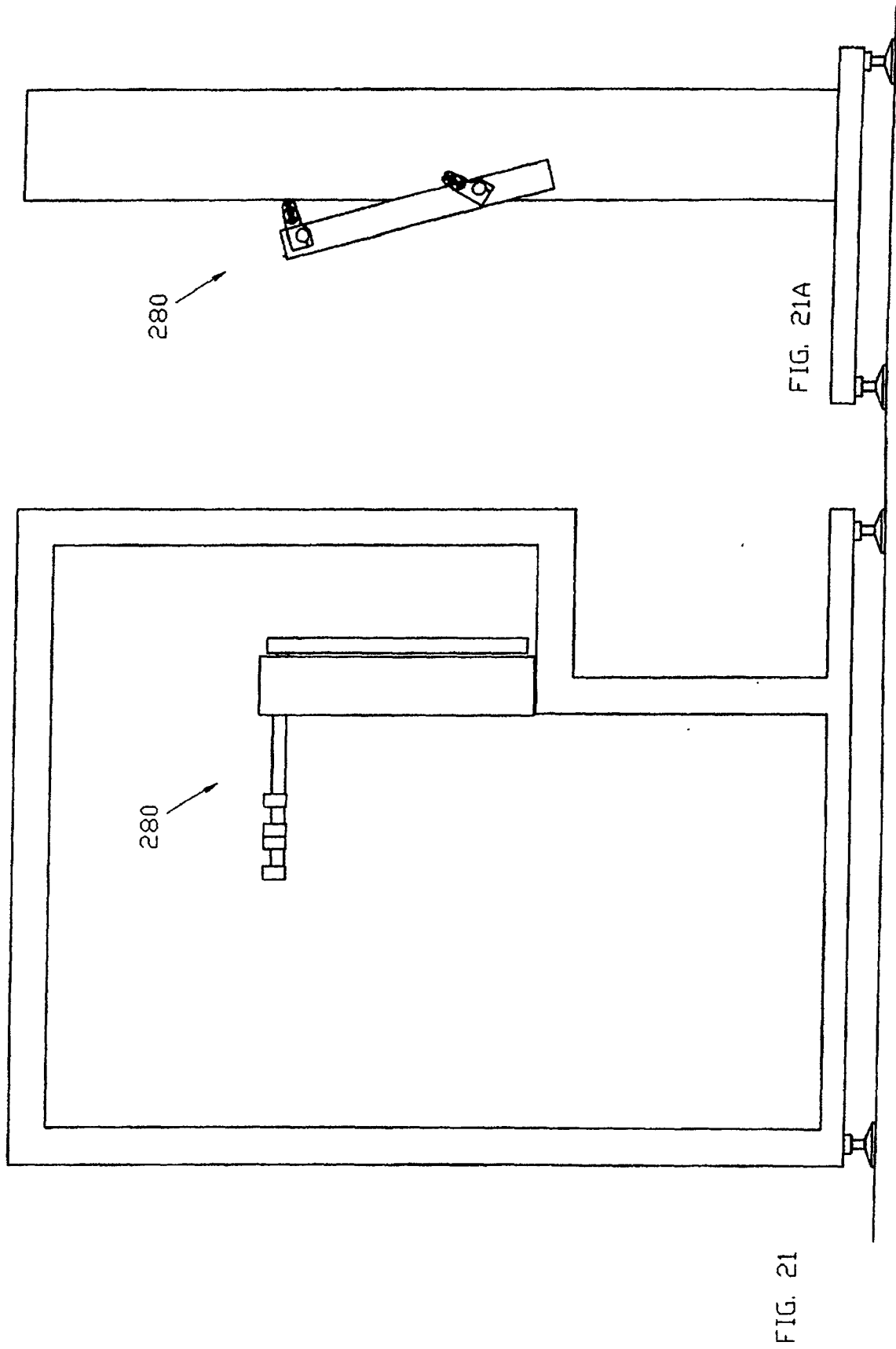


Fig. 17J5





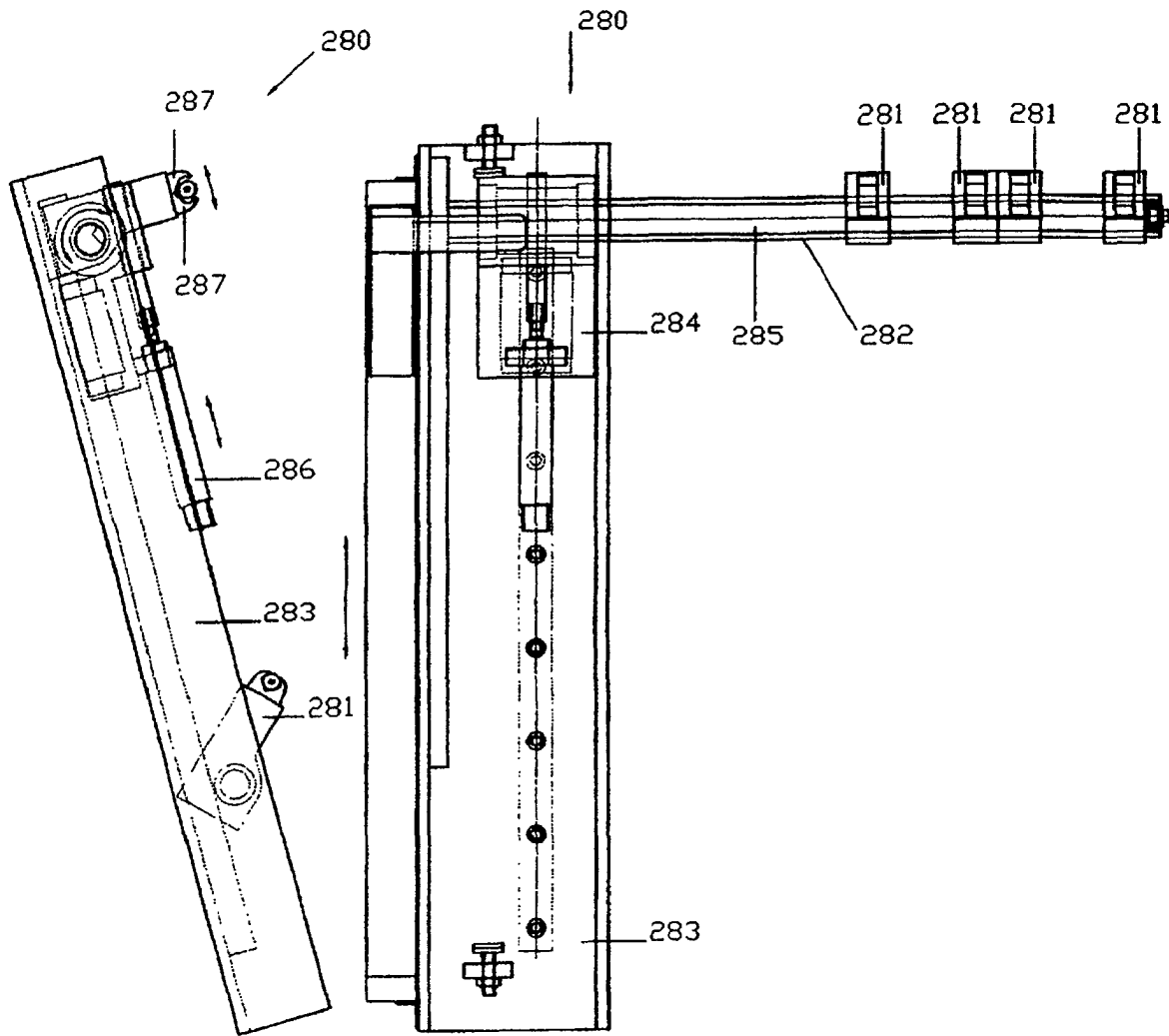


Fig. 22A

Fig. 22

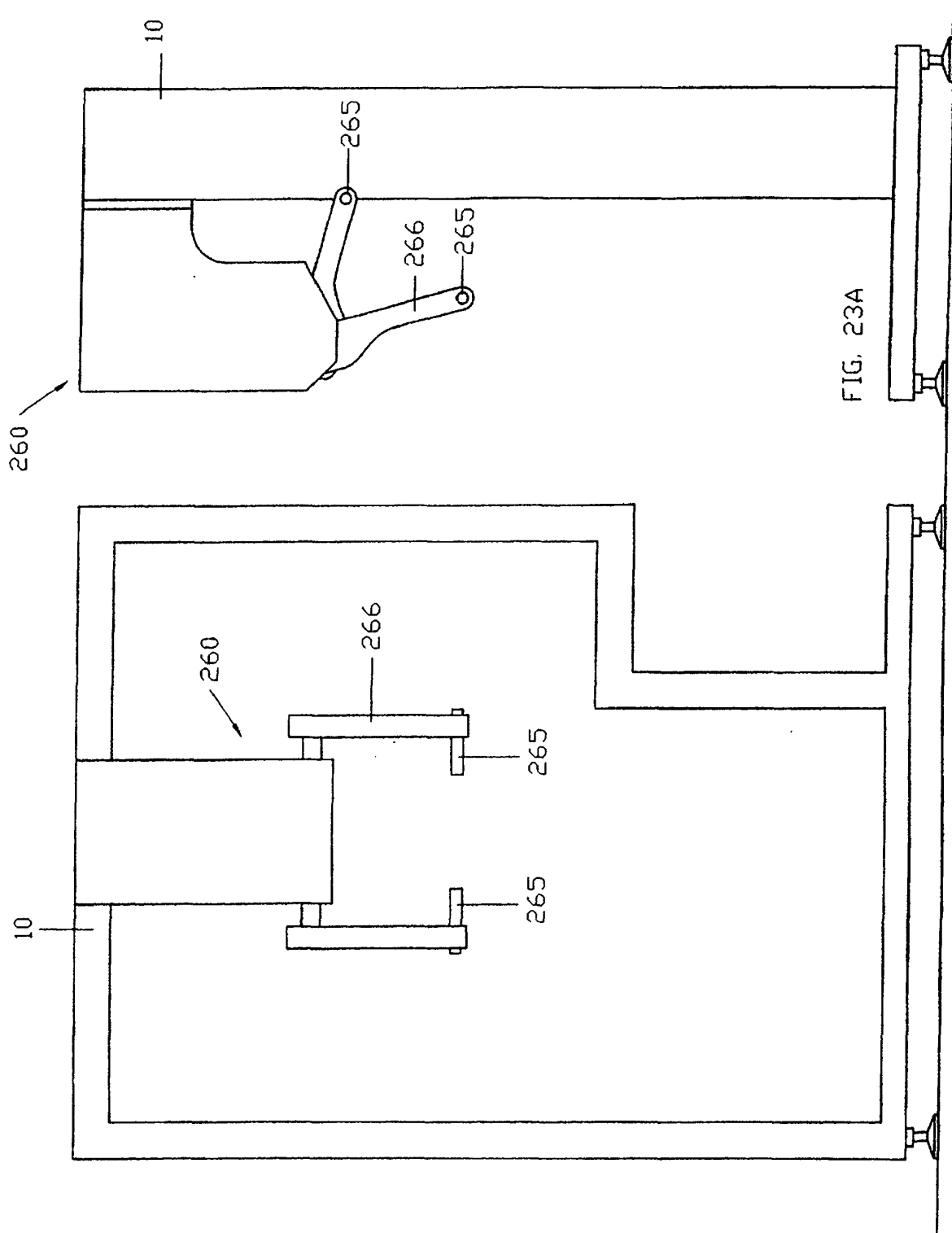


FIG. 23A

FIG. 23

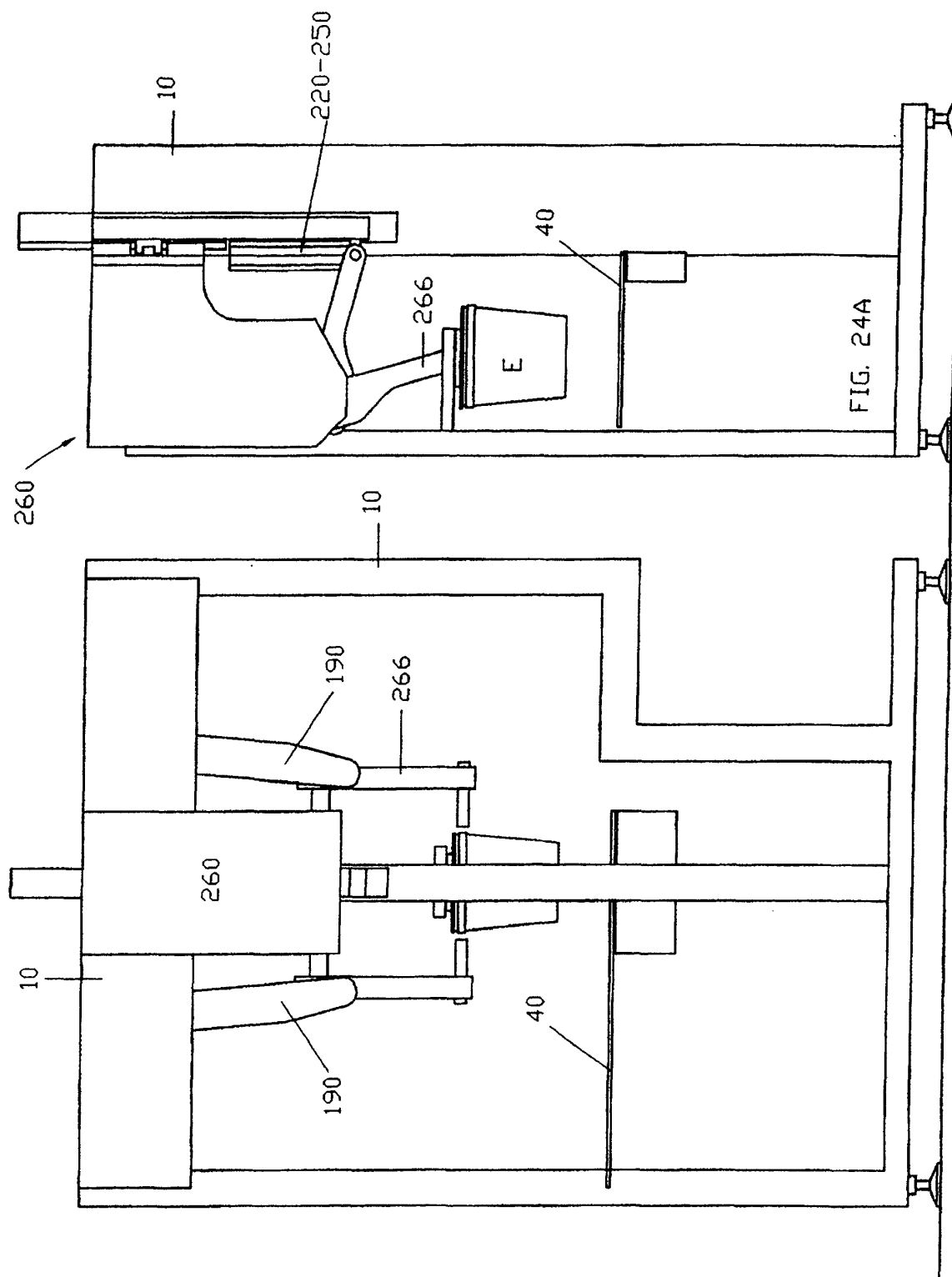
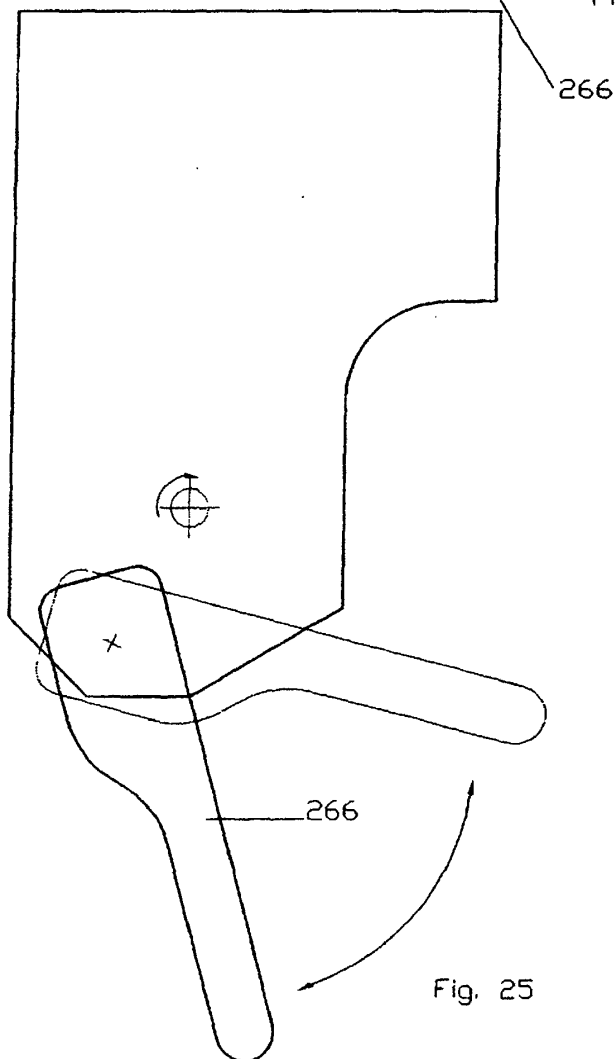
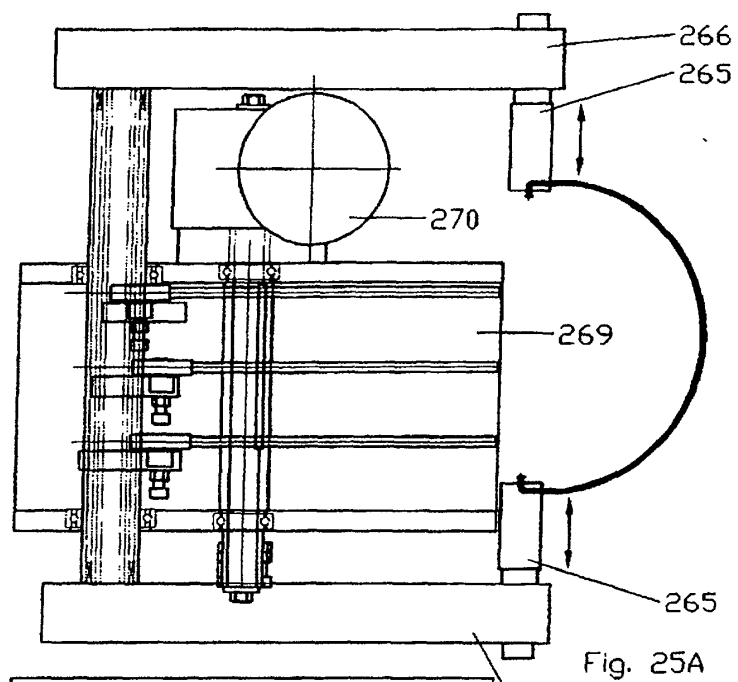
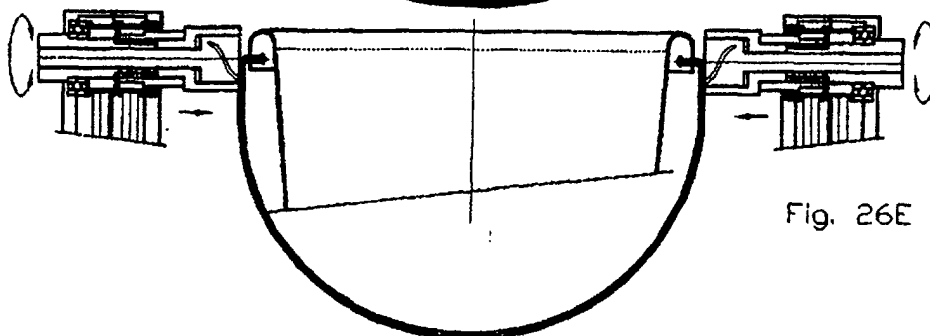
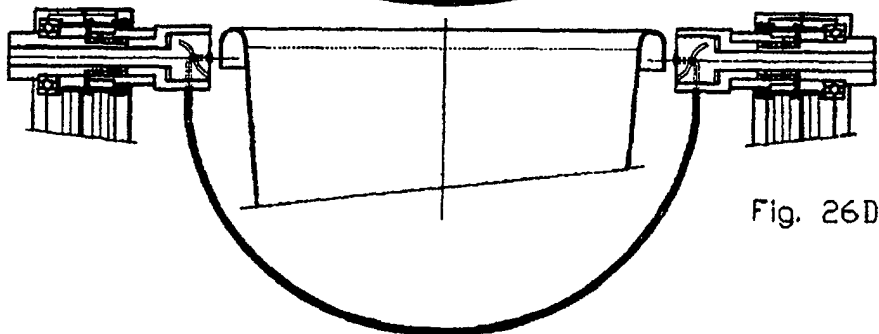
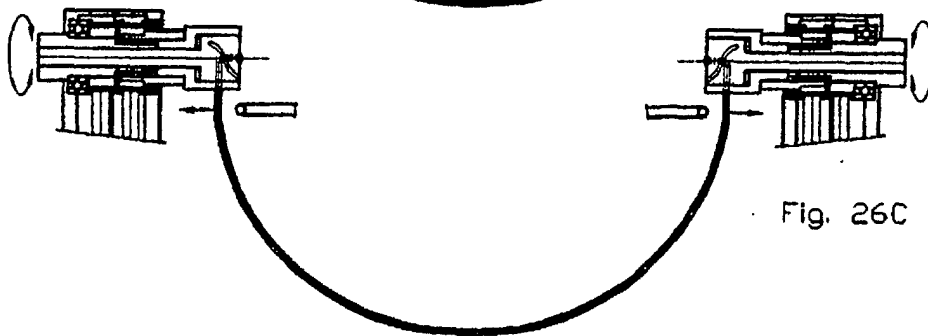
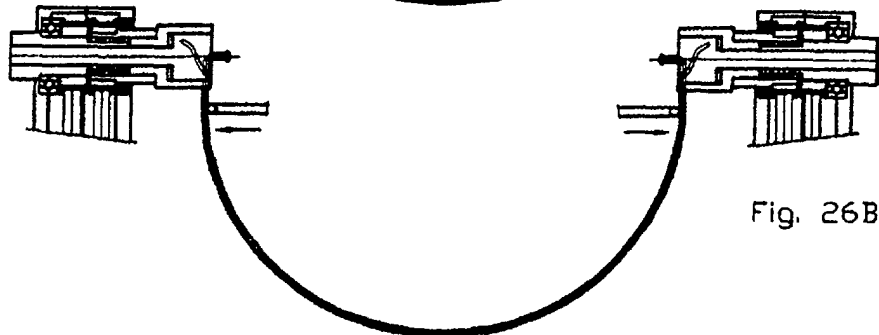
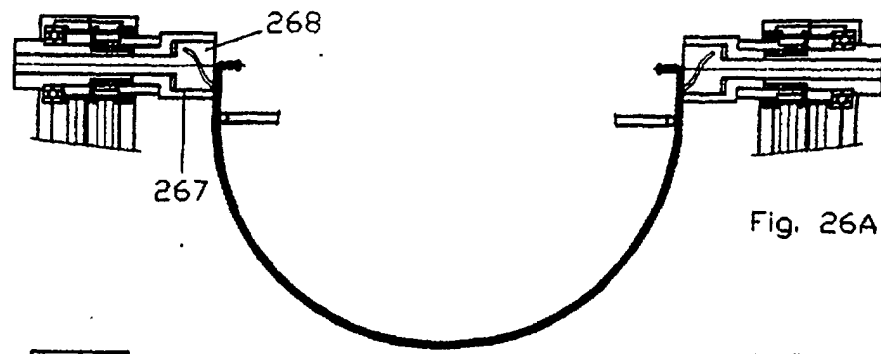
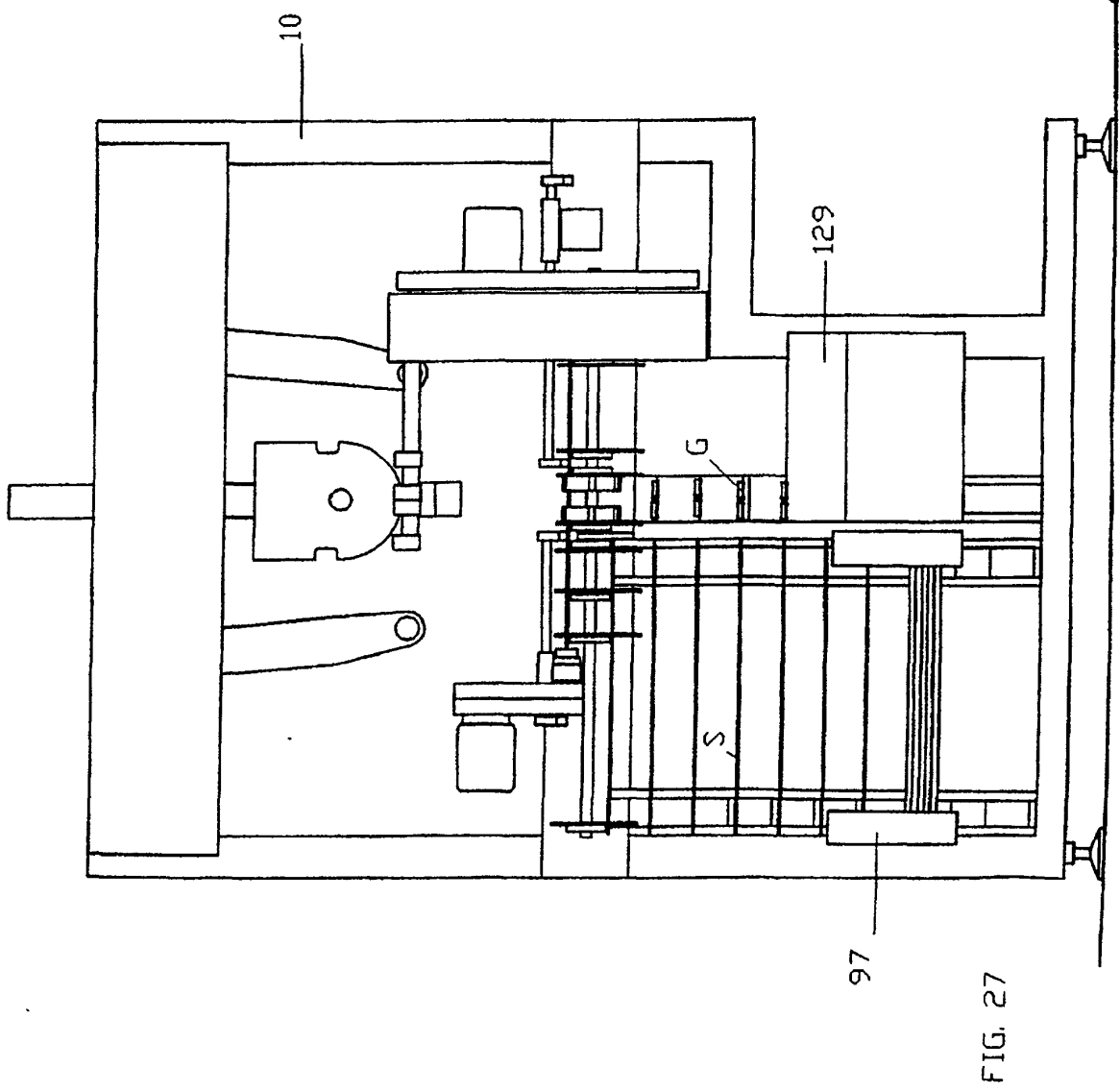
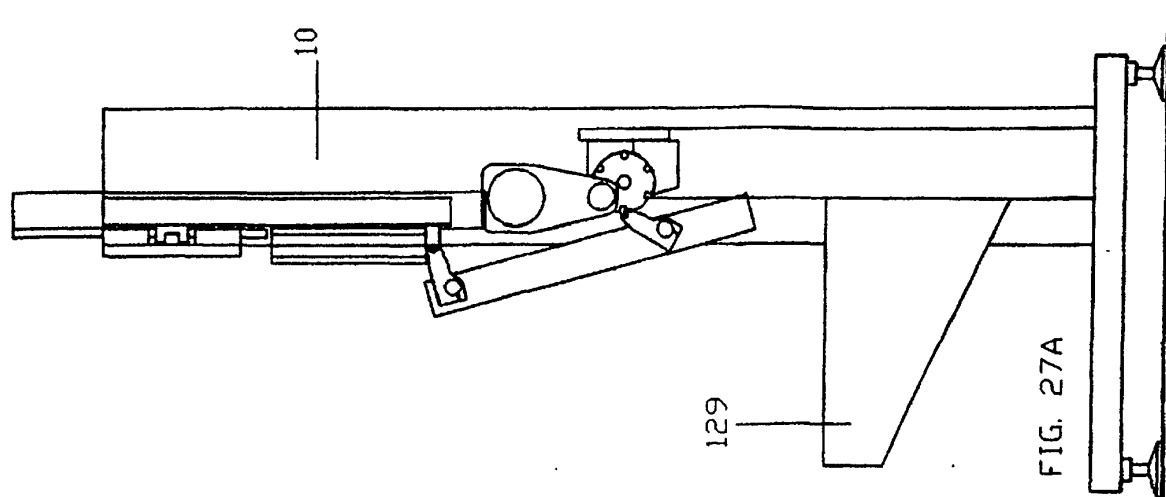
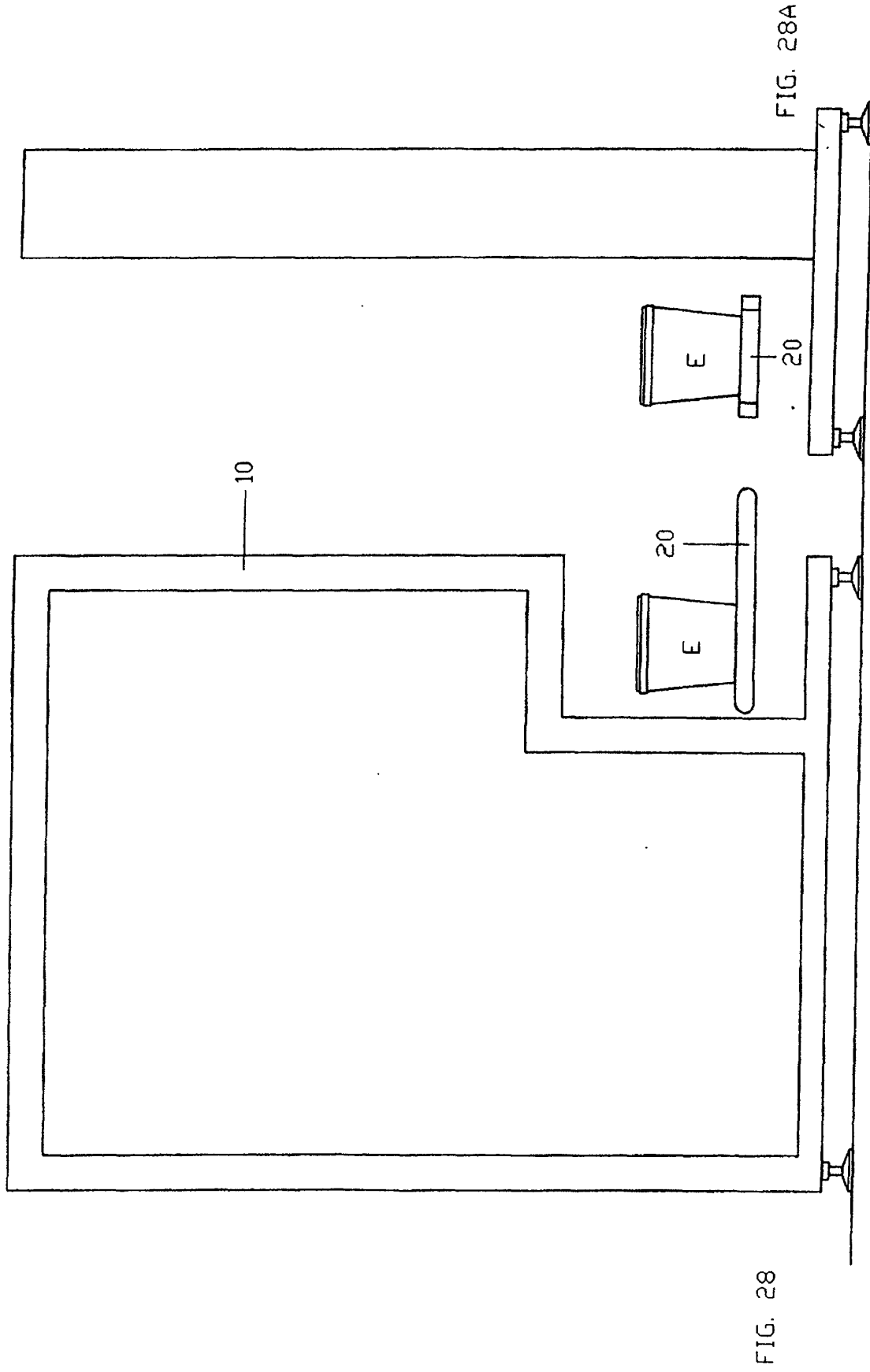


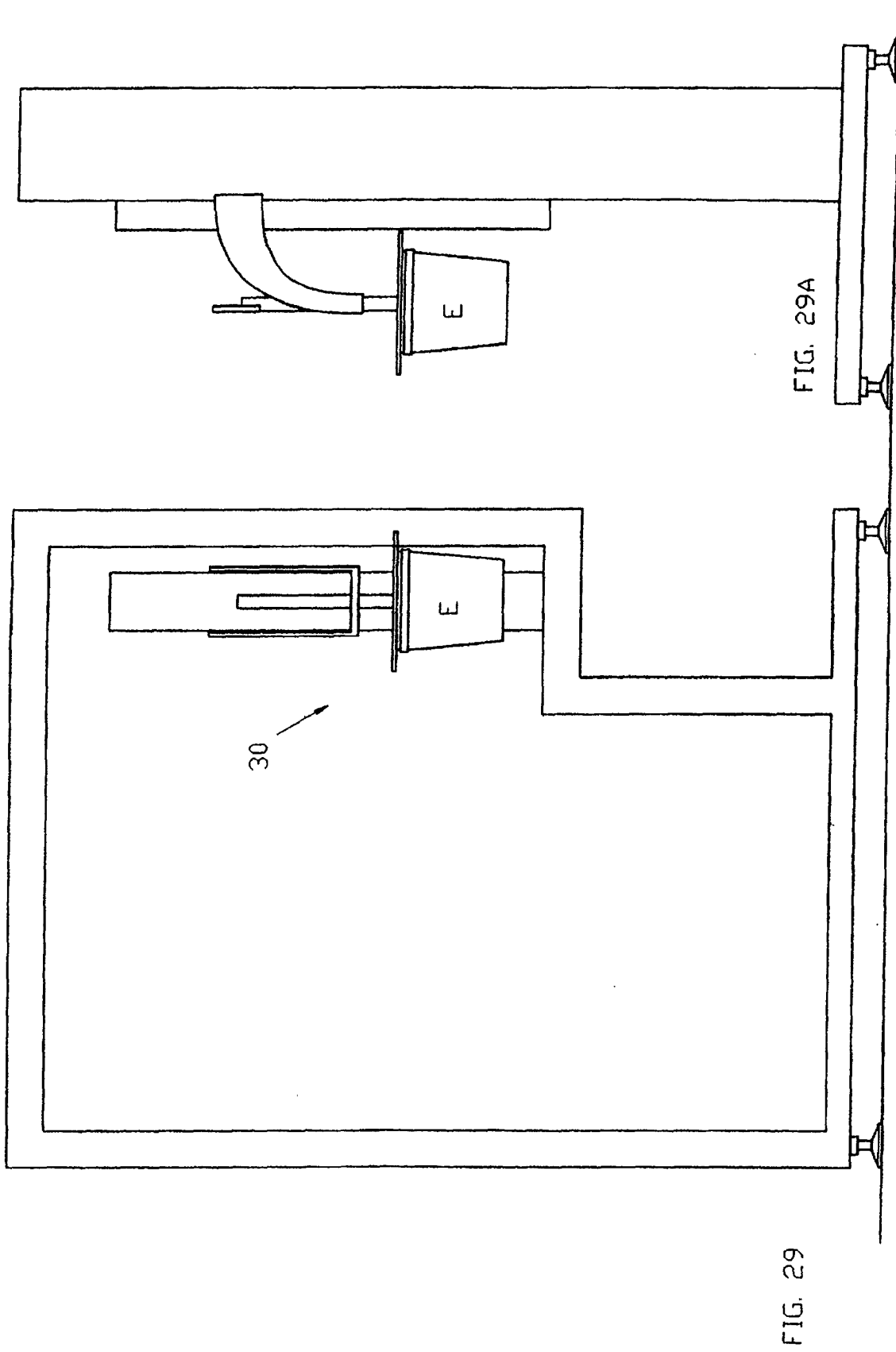
FIG. 24











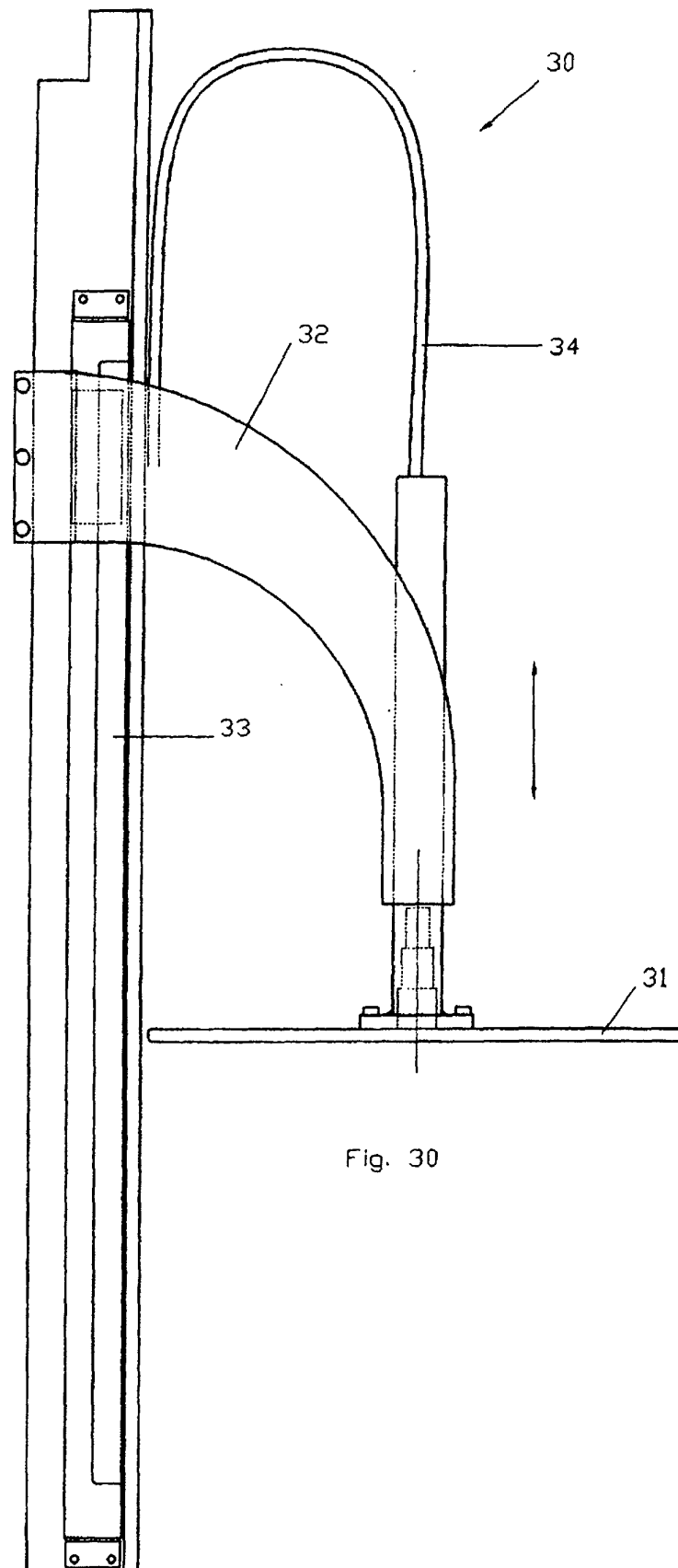
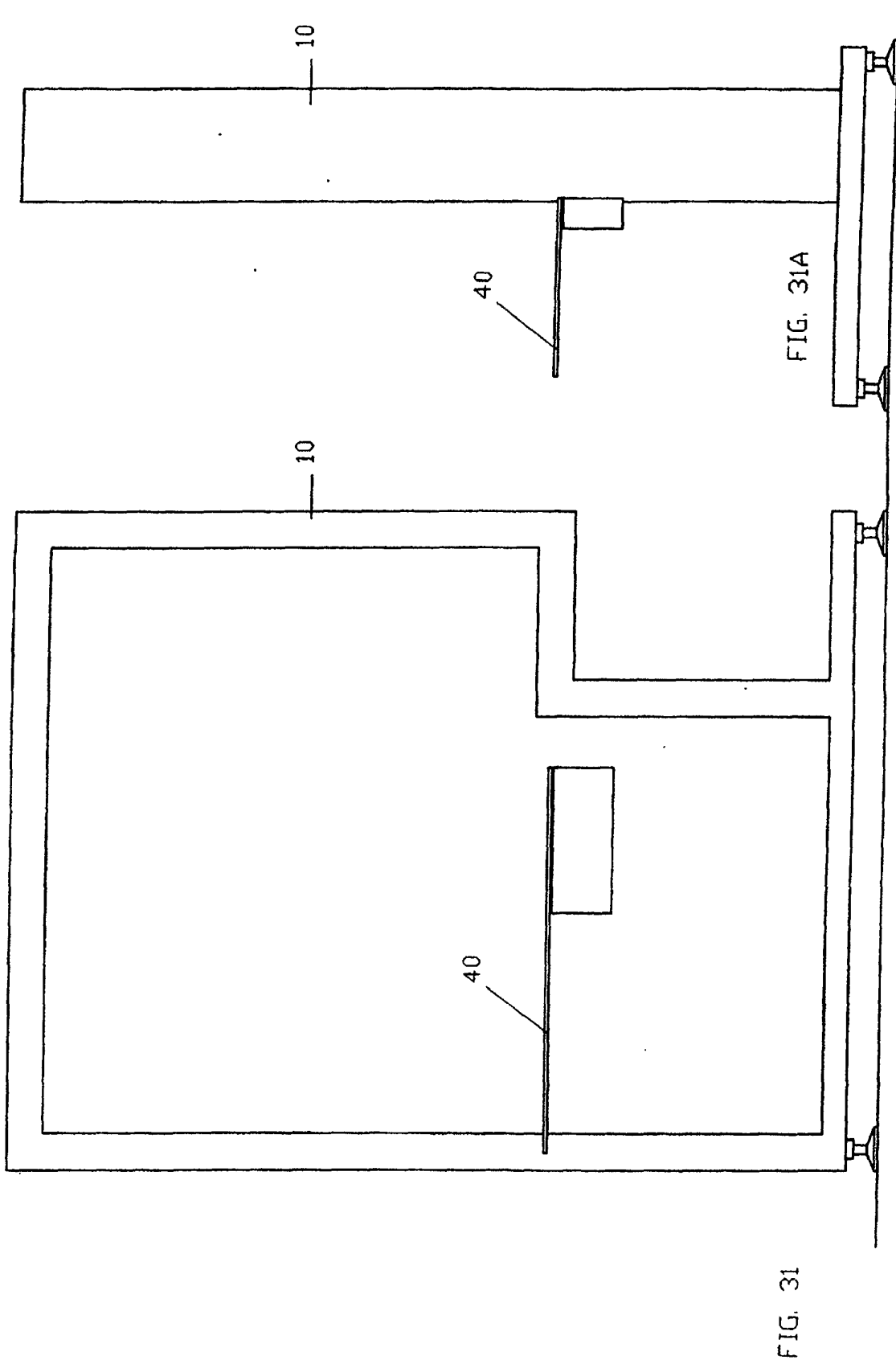


Fig. 30



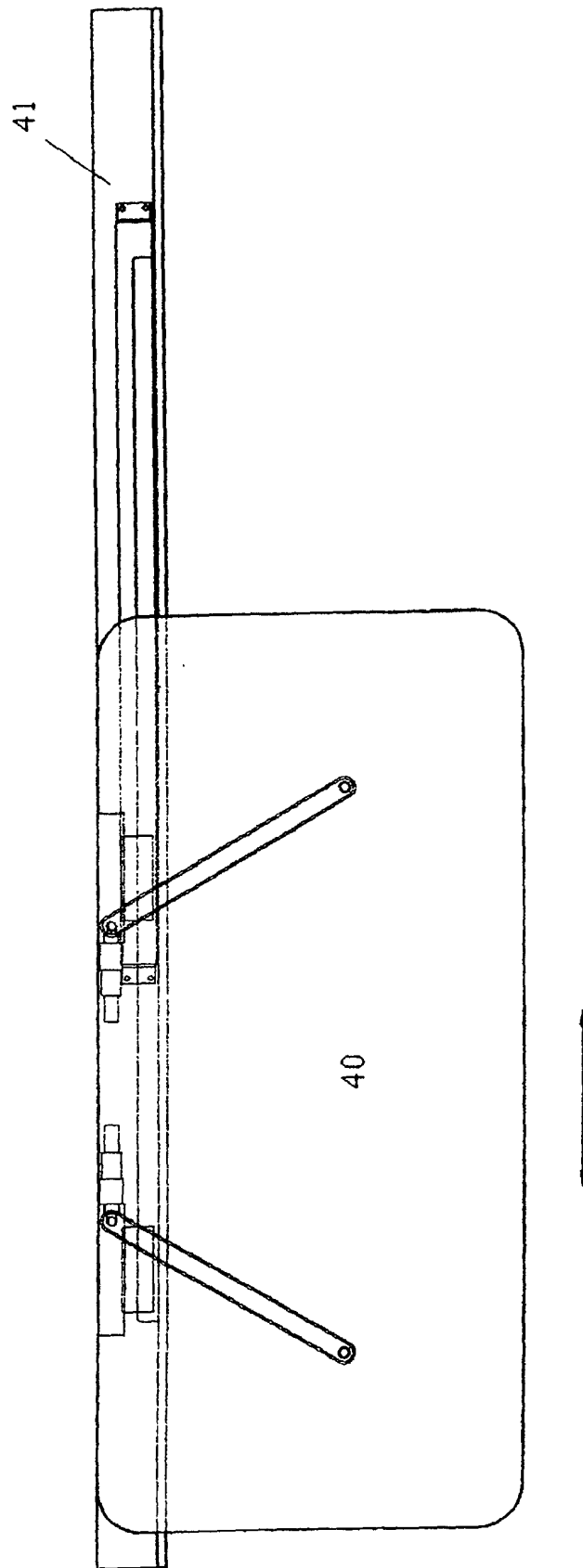
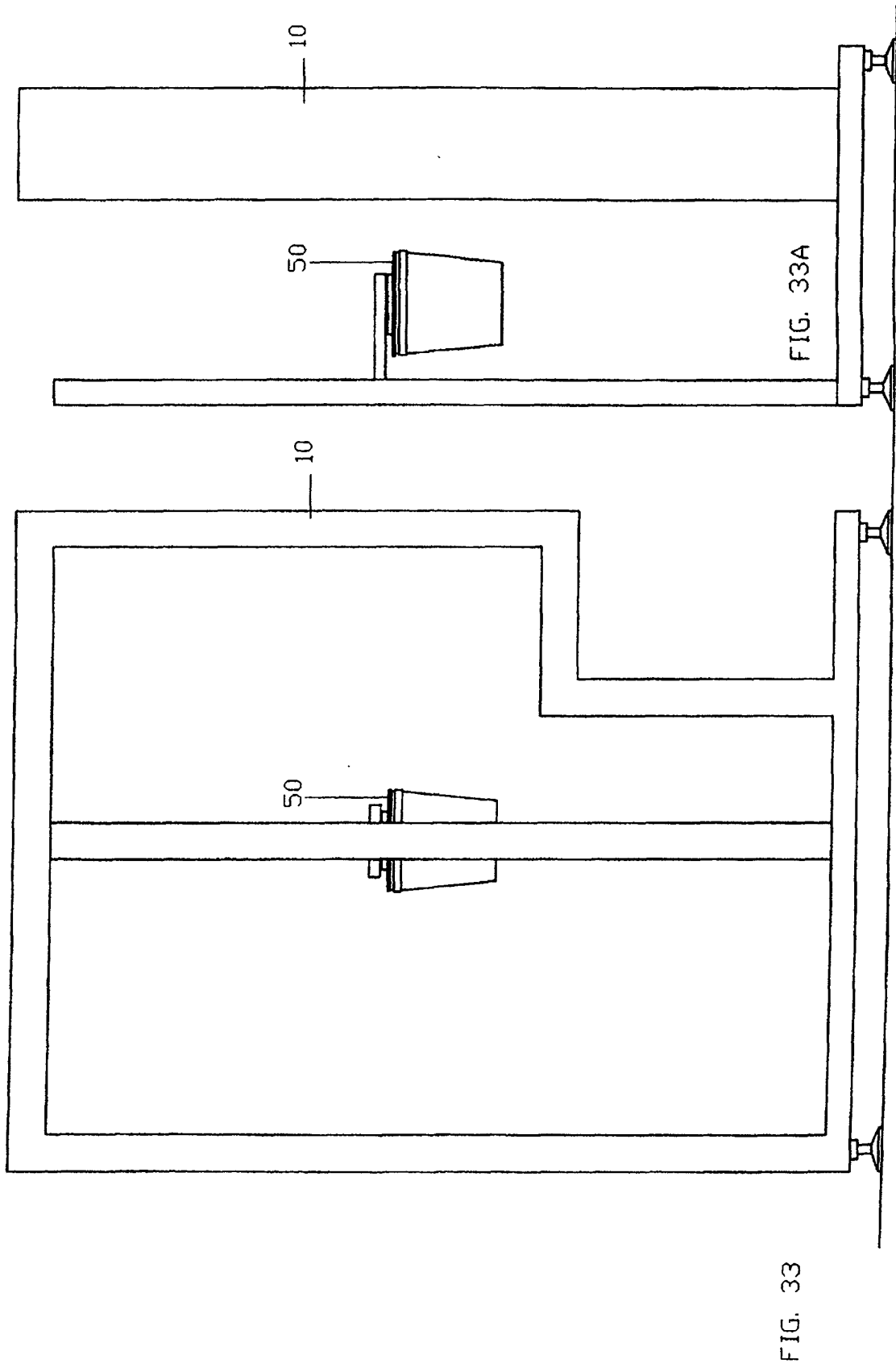


Fig. 32



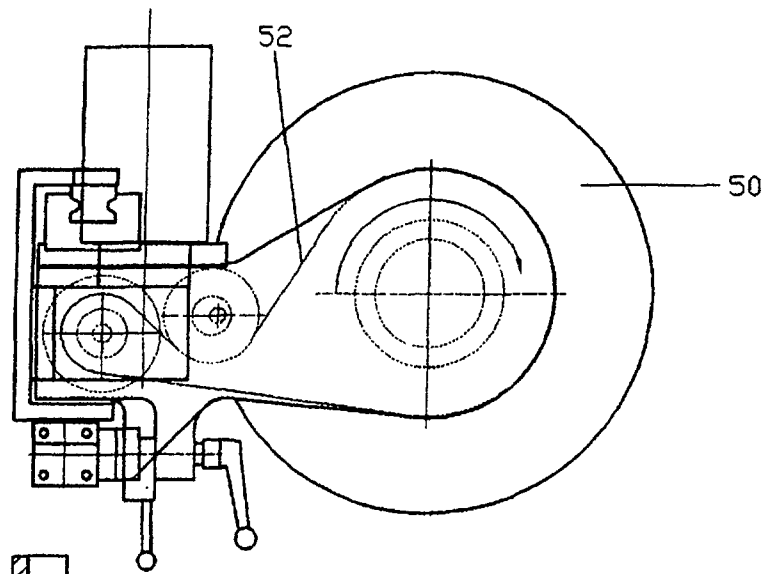


Fig. 35

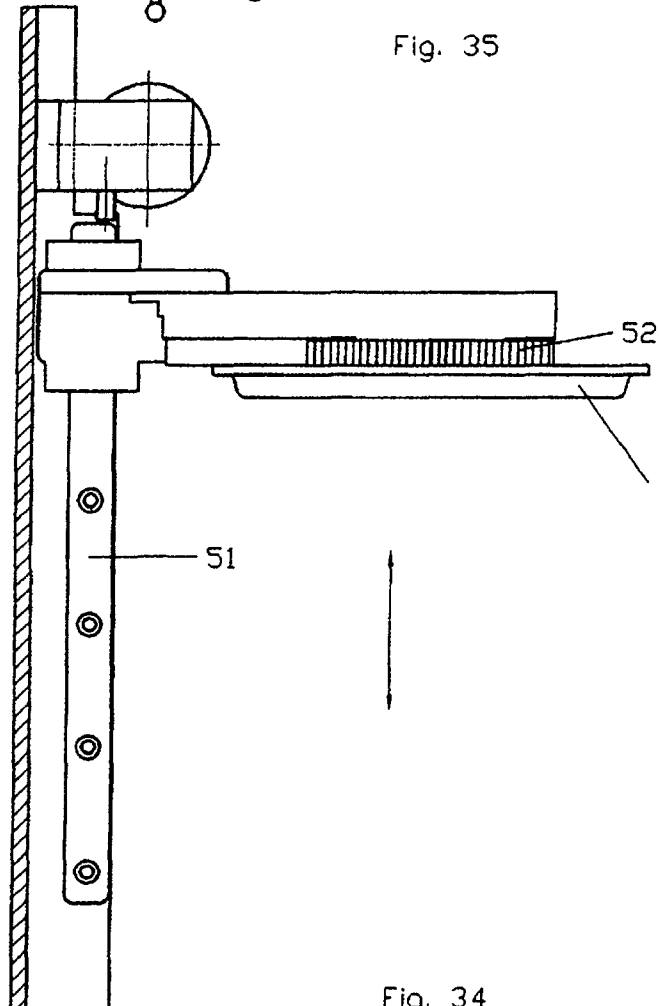
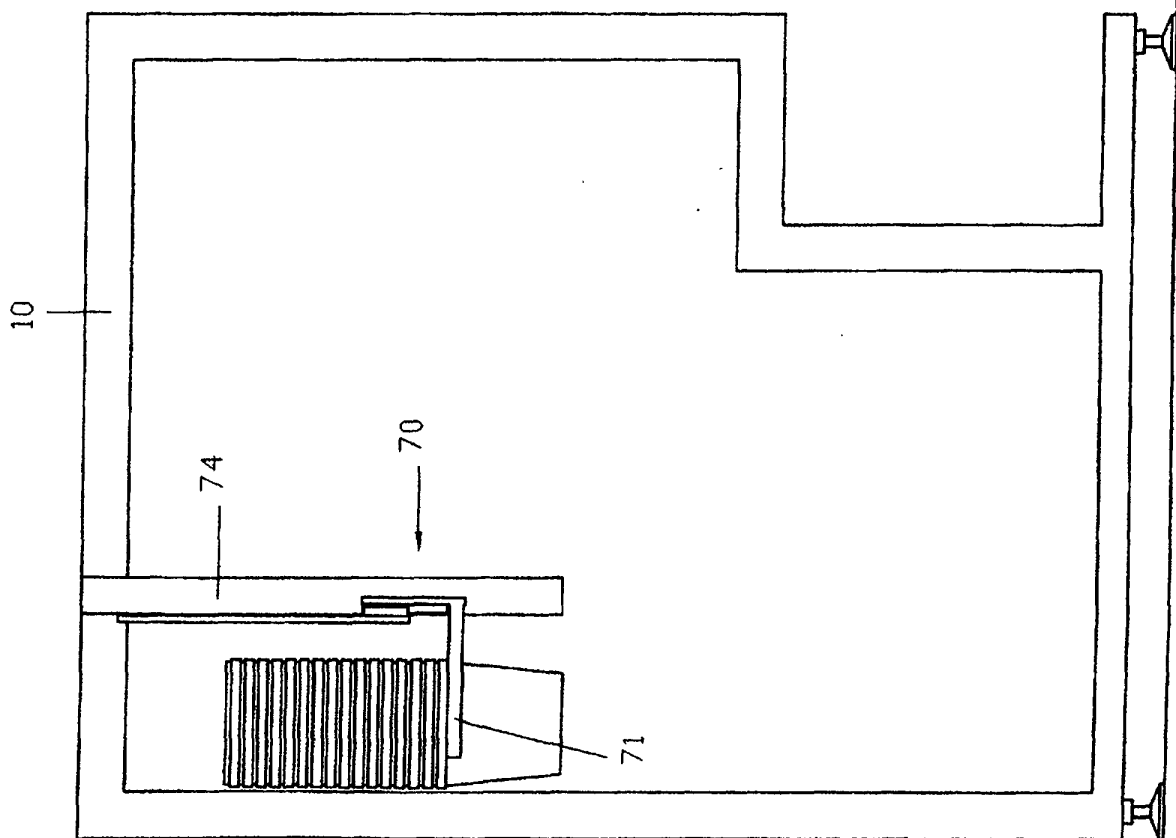
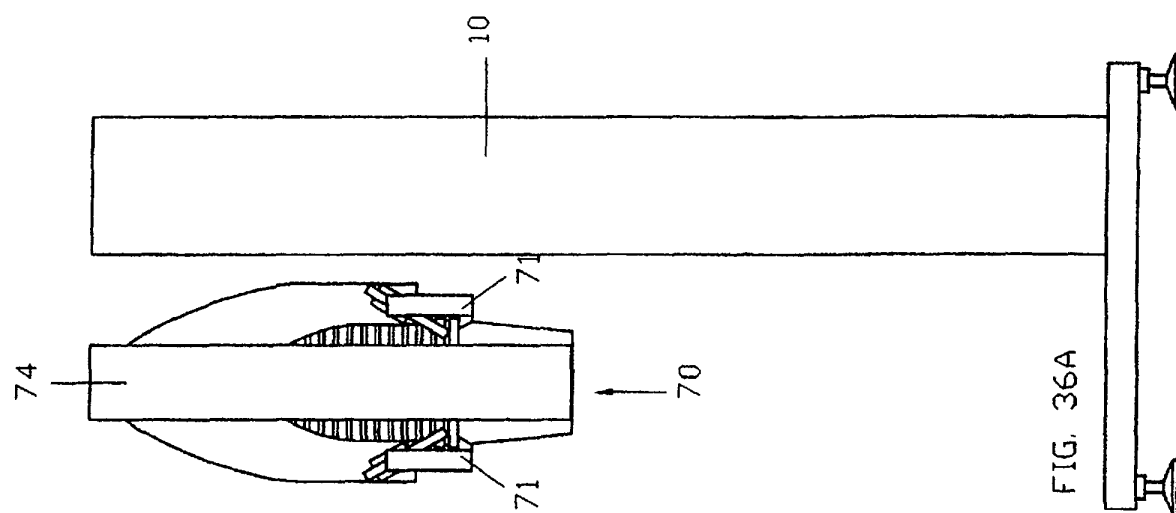


Fig. 34



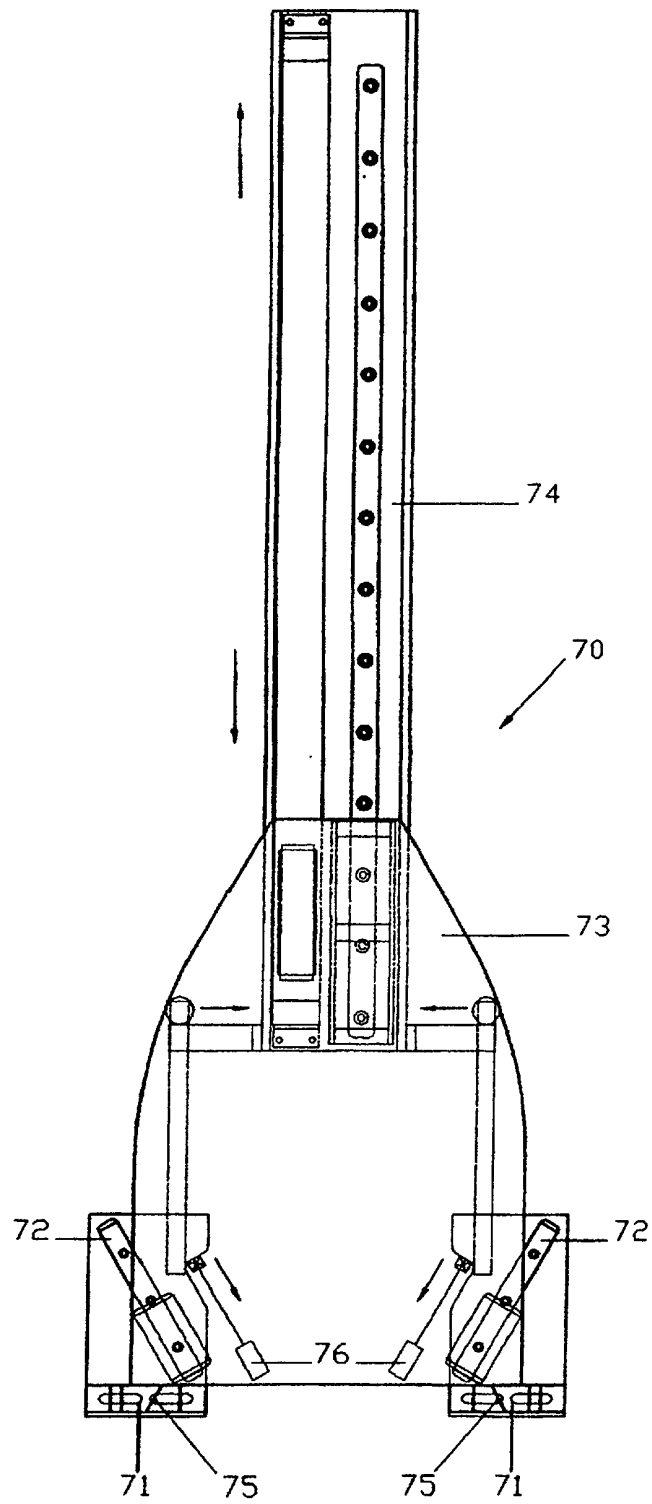


Fig. 37

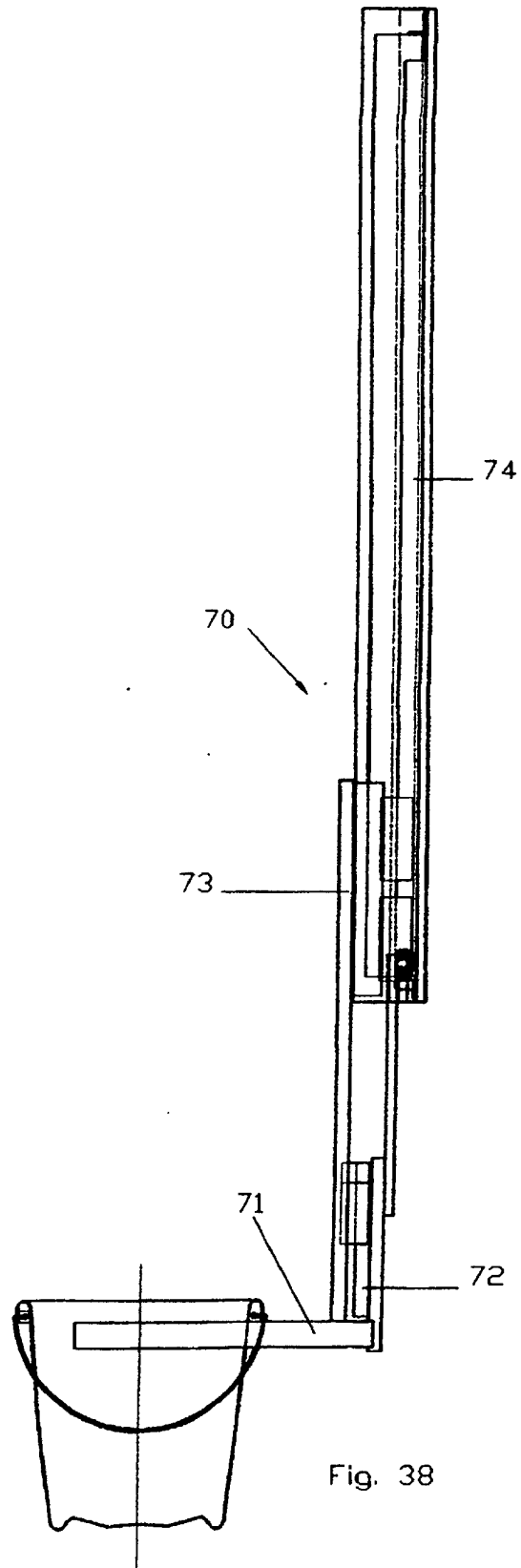


Fig. 38

