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(54) Bag filling apparatus and method

(57) A pre-made bag filling and closing apparatus. The device provides a vertical cam (104) upon which hoppers (60) travel. The cam (104) has a varying height permitting the hoppers (60) to move vertically relative to the bag. In a second embodiment, the apparatus in-

cludes a second cam (264) horizontally disposed. This second cam (264) cooperates with bag handling devices (210) to grip, open and close the bag. The second cam (264) cooperates in an actuation relationship with the bag handling device (210).

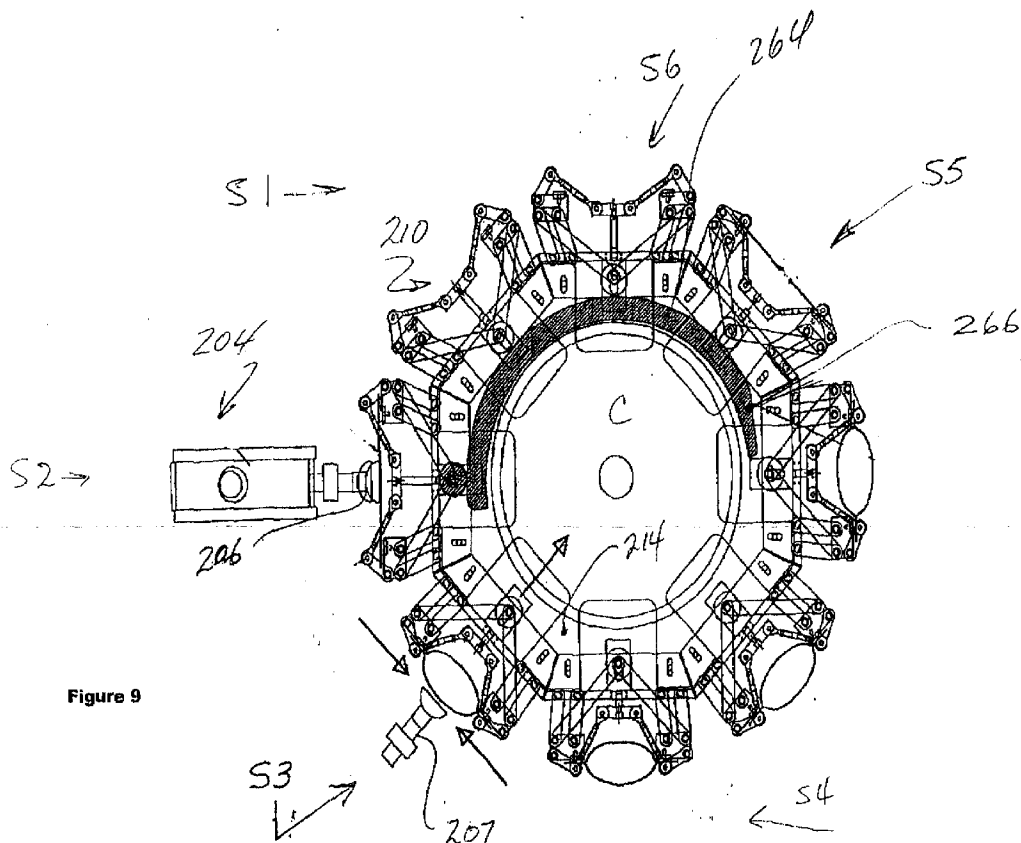


Figure 9

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Description

[0001] This invention relates to a method and apparatus for filling and discharging bags having a commodity therein.

[0002] In the prior art, there are numerous examples of devices for filling bags from a source of a commodity. Typically, in most cases, a supply of individual bags is fed to a filling hopper which can either be an in-line operation or, in some cases, the filling operation takes place about a fixed axis.

[0003] Typical of the prior art in this field is United States Patent No. 3,918,236. This reference provides a machine for forming, filling and closing containers as well as a method of use of the machine. The apparatus of this patent employs rotatable turrets for filling containers and closing the filled bags. U.S. Patent No. 2,691,476 discloses a bag filling machine having a series of hoppers mounted for rotation about a turret. This apparatus does not provide an elevational hopper system nor does it provide for sealing bags in a downstream process. U.S. Patent No. 3,323,280 teaches a variation on packaging arrangements. The apparatus opens, fills, closes and seals the bag.

[0004] US Patent No. 4,548,826 teaches a method and apparatus for packaging popcorn, incorporating a simple hopper and sealing system. U.S. Patent No. 2,833,097 covers a further variation on packaging apparatus. Other references forming background art are U.S. Patent Nos. 2,949,714, 5,442,898, 3,618,286, 3,789,570, 3,789,573, 4,124,966, 3,945,173 and 4,676,284.

[0005] U.S. Patent No. 3,822,527 provides a container handling apparatus. U.S. Patent Nos. RE-32,963, 4,774,797, 3,903,674, 4,840,016, 5,165,455, 5,177,939, 4,669,251, 3,896,605, 5,457,944, 3,868,009, 4,108,300, 3,517,477 and 4,936,440 all provide variations on bag lifting, opening and handling.

[0006] None of the prior art references listed have the combination of features that is provided with the Applicant's arrangement in terms of handling filling and sealing bags.

[0007] According to one embodiment of the invention, there is provided an improvement in an apparatus for filling and discharging bags containing a commodity therein, and in which the apparatus fills an individual bag, which is thereafter sealed and discharged from the apparatus, and wherein the improvement comprises a plurality of work sections or stations each sequentially rotatable about a fixed axis between individual stations about the axis, each work section having a filling hopper associated with the section, the filling hopper having an open mouth for loading a commodity into the hopper and a discharge end for discharging commodity from the hopper into an open bag; and means for providing relative movement between a bag having an open mouth and the discharge end of the filling hopper.

[0008] In another embodiment of this invention, there

is provided an improvement in a method for filling and discharging bags containing a commodity comprising the steps of providing a plurality of individual work sections sequentially rotatable about a fixed axis where a plurality of work stations are located, providing an array of bags in which an individual bag is to be removed and filled, providing a plurality of filling hoppers having an open mouth and an open top, presenting a bag to a hopper at one work station and effecting relative movement between the bag and the open mouth of the hopper whereby the bag is placed into filling relationship with the open mouth of the hopper, and filling the bag with a commodity.

[0009] The above apparatus and method may be employed in conjunction with bag supply means associated with the filling and discharging apparatus. Such bag supply means can be at least one indexing station mounting a plurality of individual bags adapted to be dispensed one at a time, and means for transferring an individual bag from the indexing station to the apparatus to a work section of the filling apparatus.

[0010] The above apparatus and method may also be operated in conjunction with suitable means and techniques for supplying pre-formed bags from an array thereof; one preferred arrangement is to use bag supply means which is a wicket carousel arrangement having a plurality of stations, such as four stations. In this way, one or more of the stations can be used for bag loading at any given time while one station functions as a transfer station for transferring bags from the carousel to the apparatus for filling the bags.

[0011] In such an arrangement, each station can be a replicate of the others and as such, will include means for engaging an array of individual bags such as wicket arms which can mount a bag array through apertures provided in one end of the bag structure. Bag positioning and restraining means may be associated with or more stations and at least with the station which is in operative association with the transfer point for transferring the bags from the storage station to the filling apparatus.

[0012] The improvements noted above may be used in an apparatus which is provided with sensing means to sense the presence or absence of bags at any given station. Typically, this may be a suitable controller which may be operatively associated with means for rotating the bag storage unit to permit a further station with bags to be placed at the transfer point.

[0013] According to a further object of the present invention, there is provided an apparatus for charging a commodity into a pre-made open bag and closing the bag when charged, comprising:

- a rotatable carousel;
- a plurality of hoppers movably mounted to the carousel;
- bag handling means mounted to the carousel for gripping a bag, opening the bag and closing the bag when charged with the commodity; and

cam means mounted to the apparatus along which the hoppers move for relative movement between a hopper and a bag having an open mouth to be charged with the commodity.

[0014] The improvements in the filling apparatus and method of the present invention may also be used in conjunction with a bag-receiving station operating in conjunction with the bag transfer station of the bag supply system. To this end, the apparatus includes means for releasably engaging a bag from an array of such bags at the bag storage device; such means may include, for example, a vacuum device mounted on a rotatable arm which moves between first and second positions to engage a bag at the bag array. The suction arm may then rotate a bag into operative engagement with further bag engaging means associated with the filling apparatus. Typically, this may be a second suction arm which then controls the bag after the first suction arm releases its control.

[0015] The second control arm or means may then place the bag into operative association with clamping means for controlling the positioning of a bag for subsequent presentation to a hopper or filling tube, and for operating in conjunction with bag opening means.

[0016] The bag opening means may suitably comprise a vacuum system for engaging one bag panel while the bag is controlled by the second clamping means to thereby provide an open bag mouth.

[0017] In general, with respect to the improvements of the present invention, the filling apparatus preferably comprises a plurality of work stations each of which contains filling means; such filling means may be in the form of a plurality of individual hoppers mounted generally in side-by-side relationship and all of which are mounted on a single rotatable platform rotatable about a fixed axis. In this manner, the individual filling means may be selectively operative at one or more positions as the platform rotates about a fixed axis from a starting point to a discharge point.

[0018] The filling apparatus includes means for effecting relative movement between the filling means and an open-mouth bag. Preferably, there are provided mechanical means which effect movement of a bag to bring the same into operative relationship with the mouth of a filling hopper by effecting movement of the filling hopper to engage the open mouth of a bag to be filled. For example, there can be used a cam system fixedly associated with the movable platform and which will permit vertical movement, at predetermined times, of the individual hoppers. The cam system may be a circular cam mounted on the platform having the required cam surfaces at predetermined distances so as to effect vertical movement of the hopper. To that end, each hopper may have an individual cam follower mounted directly or indirectly to the hopper whereby rotation of the hoppers as an entity will effect selective vertical movement for the individual hoppers.

[0019] After filling of a commodity into the bag by the hopper, the hopper may be removed from the open mouth of the bag and control means provided for subsequent sealing and discharge of the filled bag for further processing. Suitable means for movement of the bags may be provided such as a conveyer or spaced-apart moving tracks.

[0020] In the improved method and apparatus of the present invention, the device may include means for drawing an open mouth of a filled bag into a taut position, after the hopper has been removed. Still further, the apparatus may have a pair of spaced-apart arms movable between first and second positions.

[0021] The apparatus may include means for providing relative movement which comprises means for sequentially lowering an individual hopper between a first non-bag-engaging position and a second bag-engaging position, and for providing reciprocal movement for each hopper.

[0022] The apparatus may also include suitable means for driving the various components as required and all of which are conventional per se. The apparatus may also include conveying means for conveying filled bags between the discharge station and a sealing station.

[0023] In the apparatus described above, the discharge means may be in the form of a pair of spaced-apart movable conveyor belts movable between first and second stations. In place of a conveyor, other suitable systems for removing a filled bag from the apparatus to a point of packaging such bags may be employed in e.g. transfer clamps, etc.

[0024] The improvements to the apparatus and methods of this invention are particularly useful for filling bags or containers with flowable commodities which may range from powders to food products, or the like. The particular nature of the commodity is not critical so long as it may flow to and through the filling hopper.

[0025] A particular type of bag employed in the present invention may be any suitable bag well known to those skilled in the art. For example, many well known and conventional bags used in the packaging industry are made of materials such as polymeric materials, and normally have a closed structure at a pair of opposed ends. In the packaging operation such as is described in this disclosure, bags may be filled from either end but where special types of bag construction are used, such as with reclosable top portions, the bags will be normally filled from the bottom end.

[0026] The apparatus and method of the present invention have the advantage that with the improvements described herein, individual filling hoppers are associated with each bag and, there is positive engagement between the filling mouth end of the hopper and a bag as it rotates about different work stations on an indexing table. At each or spaced-apart work stations or sections on the indexing table, the various operations may be performed efficiently and in an expeditious manner. De-

pending on the individual work section or station, the bag and its associated filling hopper will rotate by suitable drive means which may be included with the apparatus for rotating the filling apparatus at a desired speed of rotation.

[0027] A further object of one embodiment of the present invention is to provide an apparatus for charging a commodity into a pre-made open bag and closing the bag when charged, comprising:

- a frame;
- a rotatable carrousel mounted for rotation on the frame;
- a plurality of hoppers movably mounted to the carrousel;
- bag handling means mounted to the carrousel for gripping a bag, opening the bag and closing the bag when charged with the commodity;
- actuation means connected to the frame and operative with the bag handling means for actuating the bag handling means in a predetermined sequence for gripping the bag, opening the bag and closing the bag; and
- cam means mounted to the apparatus along which the hoppers move for relative movement between a hopper and a bag having an open mouth to be charged with the commodity.

[0028] Having thus described the invention, reference will now be made to the accompanying drawings illustrating preferred embodiments, illustrating preferred embodiments and in which:

Figure 1 is a side elevational view of the bag packaging machine;

Figure 2 is a top plan view of the apparatus of the invention;

Figure 3a is a side elevational view of the bag transfer station;

Figure 3b is a side elevational view of a pre-load arm engaging a bag in a first position;

Figure 3c is a side elevational view showing a pre-load arm transferring a bag to the loader arm;

Figure 3d is a side elevational view showing the loader arm positioning a bag in the clamp positioning area;

Figure 3e is a side elevational view showing a pneumatic clamp clamping the bag;

Figure 4a is a side elevational view showing the bag opening system.

Figure 4b is a side elevational view showing the suction cup arm of the bag opening system attaching itself to one side of the bag;

Figure 4c is a side elevational view showing a bag being pulled open with the use of suction cup and the discharge mouth of a hopper descending into the open mouth of the bag;

Figure 5 is a cut away view of a hopper cam system in one embodiment;

Figure 6 is a partial sectional side elevational view showing the bag settling and stretching mechanism;

Figure 7 is a partial sectional side elevational view showing the gripping mechanism for the conveying system for transferring the filled bags from the filling apparatus for subsequent processing;

Figure 8 is a side elevational view of a further embodiment of the bag packaging machine;

Figure 9 is a top plan view of the apparatus of Figure 8;

Figure 10 is a plan view of the clamping arrangement isolated from the entire apparatus according to the embodiment shown in Figure 8;

Figure 11 is a side view of Figure 10;

Figure 12a is a plan view of the clamping arrangement in a state absent a bag;

Figure 12b is a plan view of the clamping arrangement with a bag in position;

Figure 12c is a plan view of the clamping arrangement with the bag in an open position;

Figure 12d is a plan view of the clamping arrangement with the bag in a closed position;

Figure 13a is a side view of the clamping arrangement of Figure 8 with the bag being presented to the clamping arrangement;

Figure 13b is a side view of the clamping arrangement of Figure 13a with a bag in position between the clamps;

Figure 13c is a side view of the clamping arrangement of Figure 13a with a bag in an open position ready for charging with commodity; and

Figure 13d is a side view of the clamping arrange-

ment of Figure 13a with a bag in a closed position charged with commodity.

[0029] Similar numerals in the figures denote similar elements.

[0030] Referring initially to Figures 1 and 2, the apparatus of the present invention is made up of two main sections designated by reference letters A and B; reference letter A designates the bag array storage system and reference letter B the filling and discharge apparatus.

[0031] Referring to the bag storage system, a plurality of separate but substantially similar stations are located on a movable index table 20 rotatable about a fixed axis through a support 22, mounted to a suitable frame member F of the overall apparatus. In the embodiment illustrated four separate bag stations are shown indicated generally by reference numeral 24, each mounting an array 32 of individual bags. Each station comprises a pair of spaced-apart arms 26 adapted to journal an array of bags provided with a pair of spaced-apart apertures at one end of the bag. The bags are suspended in a generally vertical fashion (Figure 1) and retained by a bag restraint member 28 so that the front-most bag to be dispensed from the array is in a generally vertical configuration.

[0032] With the arrangement illustrated in Figure 2, three separate bag storage areas are provided so that individual supplies of the bags can be presented to the fourth bag station, designated generally by reference numeral 30, where the bags are individually transferred to the filling system described hereinafter.

[0033] Transfer of individual bags is accomplished by a mechanism now to be described: reference is made in particular to Figures 3a through to 3e which show a pre-load arm 34 journaled by a rotatable cylinder 36 and movable between bag engaging and bag disengaging positions (Figures 3a and 3b). As shown in Figure 3a the arm is in a vertical non-active position and in Figure 3b, actuation of the cylinder 36 will rotate the arm 34 into engagement with a first individual bag of the array 32 so that the suction head 38 of the arm 34 is in juxtaposition with a bag. Actuation of a vacuum source (not shown) connected to the suction head will cause an individual bag 42 to be dislodged from the array 32 and thereafter moved by rotation of the arm 34 into an initial position for subsequent engagement by a vertical loader arm 40 (Figure 3c).

[0034] The vertical loader arm 40 is adapted to receive a bag from the pre-loader arm 34 and is movable between first and second vertical positions; the arm 40 includes a suction portion so that the upper portion or header of a bag can engage the suction portion to be placed under control of the arm 40 for subsequent presentation to clamping means. Vertical arm 40 is mounted by a suitable support 46 which in turn is journaled by one or more sliding arms 48 mounted on suitable actuation means such as a piston 49. Actuation of the as-

semblies 49 will thus elevate and retract support 46 and hence arm 40 to effect vertical movement of the bag into engaging position with a clamping assembly.

[0035] The clamping assembly shown in the drawings comprises a pair of spaced-apart movable jaws 50 and 52 connected to suitable actuation means such as a piston assembly indicated generally by reference numeral 54. This assembly operates in conjunction with arm 40 as described above. Once the leading edge of a bag 42 is presented to the clamping assembly, at least one of the clamping members 50/52 moves towards the other to engage the leading edge of the bag (Figure 3e).

[0036] Once the bag is under control of the clamping means, the platform 46 and arm 40 are moved downwardly (Figure 3e) and the cycle may be repeated. At this point, the bag control now rests with the filling section B.

[0037] Referring to the filling assembly B, as will be seen from Figure 2, a plurality of individual hoppers 60 are provided, which are rotatable about a fixed vertical axis with each hopper being adapted for relative vertical movement with respect to an individual bag 42 for filling purposes.

[0038] The hoppers 60 each have an open top for receiving a commodity therein, and a funnel-shaped discharge mouth for discharging a predetermined amount of commodity into a bag. Advantageously, the system of the present invention may employ from three to twelve or more hoppers depending on the type of commodity to be packaged.

[0039] The hoppers 60 are rotatable between several different spaced-apart stations serving different functions about the vertical axis. In particular, for orientation purposes, a first index station may be termed that at which a bag is presented to the filling system in the manner described above where hopper 60a is located (Figure 2) with the system rotating counter-clockwise in the arrangement shown. The different stations may include one or more stations during which a bag in an open position is presented to the filling mouth of the hopper, one or more stations during which the commodity is placed within an individual bag, one or more bag orientation stations and one or more discharge and/or sealing stations. In the arrangement shown (Figure 2) hopper 60a is at a second index station which is a bag-opening station which employs a bag-opening arrangement illustrated in greater detail in Figures 4a through 4c. In this arrangement, a suction head 70 connected to a vacuum source (not shown) is mounted on an arm 72 which is rotatable about a fixed axis using support member 74. Piston assembly 76 through piston rod 78 engages arm 72 to effect lateral movement of the arm and permit suction head 70 to open an individual bag 42 by pulling on one panel of the bag 42. As shown in Figure 4c, the bag, when in an open position, still has an upper portion engaging a leading edge to retain the bag in an open filling position.

[0040] At the third index station, hopper 60c is shown

in its initial position where it begins lowering the open mouth of the hopper into the open mouth of the bag, using the cam arrangement described in greater detail hereinafter. The specific form of the apparatus using, for example, seeds as a commodity, would involve the filling at two or more different index positions represented by stations 4 and 5 where hoppers 60d and 60e are illustrated. During this operation, the hopper mouth is placed within the bag and the commodity drained.

[0041] The position represented by hopper 60f represents an index station during which the hopper mouth is removed from the bag mouth and a pair of spaced-apart movable fingers inserted in the open mouth of the bag between the opposed side edges. To this end, and referring to Figure 6 in particular, a pair of rotatable arms 82 with fingers 83 are journaled by spaced-apart rotatable heads 80 mounted by suitable frame members 85, are vertically movable into and out of the mouth of a bag, by heads 80 rotating whereby fingers 83 move from a horizontal position to a downwardly extending vertical position. These arms are spaced-apart a distance sufficient to permit the side edges of the bag to be placed in a taut position thereby presenting the bag for a subsequent operation and to permit the contents of the bag to settle.

[0042] A conveyor system is employed in the filling apparatus to remove the bag for further processing, namely, a bag sealing operation and discharge operation. As shown in the drawings, and in particular Figure 7, the conveyor system comprises a pair of spaced-apart rotatable belts 90 and 92 rotatable about fixed axes using e.g. pulleys 94 (two of which are shown on the drawing). Suitable drive means are provided for either intermittently or continuously operating the conveyor belts. The conveying system employed may be one where one of the belts 92 is mounted on displacement means, such as a piston 95 having a reciprocating rod 97 connected to a frame member 99, which in turn, is connected to one of the pulleys 94. In this way, one of the belts 92 may be displaced into an open mouth or convergent configuration to receive a bag from the clamping system previously described. The conveyor belts may thus initially present an open converging mouth for the upper portion of the bag and by displacement of the movable belt into engagement with the opposed belt, the conveyor belts are then in a bag-engaging position for effecting movement of a filled bag from the filling apparatus to a bag-sealing station.

[0043] A bag-sealing station, indicated generally by reference numeral 105, of any conventional configuration, may also be included; such bag sealers which are known as band sealers, may include trimmers for removing excess bag material.

[0044] Referring to the drawings again, and in particular Figures 1, 2 and 5, the drive system will now be described relative to a single hopper with the cam system. In general, the system illustrated operates by mounting the hoppers about a carousel arrangement so

that each hopper is sequentially sequenced for different operations at different indexing stations. In the embodiment shown, the hopper arrangement has eight symmetrical stations with eight hoppers; each station or section utilizes a hopper mounted by suitable support members 100 which together with a rotatable wheel 102, forms a cam follower system operating in conjunction with a cam indicated generally by reference numeral 104. Cam 104 has a profile, as shown in Figure 5, where the cam heights vary depending on the desired vertical displacement of the hoppers 60, the cam being in vertical relation with respect to the hoppers 60. The lower cam surface, shown on the right hand side of Figure 5, will permit the open mouth of the hopper to be inserted into the open mouth of the bag and travel, as described above, between two or three index stations. The cam, on its left hand side shown in Figure 5, will effect a higher vertical disposition of each hopper 60 as it rotates about the carousel or index table for the bag loading, bag opening and the like positions.

[0045] Referring to Figure 1, the hopper support system may suitably include a frame assembly 106 which can also serve to mount the clamping means previously described. In addition, vertical guide members or bearings 108 may be provided for guiding supports 100.

[0046] Suitable drive means for rotating the hopper assembly can be provided by a suitable motor 120 connected to a suitable speed inducer 122. A slip ring assembly 124 may also be used in conjunction with the apparatus; suitable scale and filling means for providing a desired amount of commodity to each individual hopper (not shown) may be included.

[0047] With reference to a second embodiment of the present invention, a discussion of Figures 8 through 13d will now be made.

[0048] In this embodiment, the two distinct stations, A and B remain. The array of bags 32 (not shown), which may be wicket type bags or any other typical commodity bag, are dispensed by a dispenser 200. Dispenser 200 dispenses individual bags 32a from array 32 (not shown) on to a collector 202. From here a bag selector 204 selects an individual bag 32a with, for example, a suction cup member 206. The selector 204 then rotates about a horizontal axis to present the bag 32a to station B and more particularly to the clamping arrangement, globally denoted by numeral 208. Once the bag 32a is clamped, the suction on cup member 206 is released and the selector 204 returned to a position orthogonal to the clamping system to resume selection of another bag 32a.

[0049] Referring now to Figure 9, the clamping system, broadly indicated by numeral 210, is illustrated in position. The bag positioning, bag opening, bag filling, bag charging and bag unloading operations are all depicted as well as the stages of operation of the clamping arrangement. Figure 10 illustrates in greater detail the mechanical features of the clamping arrangement 210.

[0050] The arrangement 210 provides a horizontal

support 212. Support 212 is movably mounted to a carousel skirt 214, shown in Figure 9, which supports and mounts the remaining members of the clamping system 210. Support 212 includes two spaced apart elongate apertures 216 or races each of which receives a pin 218 fixed to skirt 214. This allows movement of the support 212 relative to skirt 214. Support 212 mounts a first pair of parallel linkages 220 and a second pair of similar linkages 222. Each pair of linkages 220 and 222 includes linkage members 224, 226 and 228, 230, respectively. The linkages 220 and 222 are pivotally mounted to support 212 and clamp blocks 232 and 234, respectively.

[0051] Clamp blocks 232 and 234 are similar to those discussed herein previously and each provide a fixed clamping member 236, shown more clearly in Figure 11, and a movable clamping member 238, which member 238 is movable relative thereto between clamping and non-clamping positions, the latter being illustrated. Linkages 224, 226 and 228, 230 are pivotally connected to a fixed clamping member 236 of each of blocks 232 and 234, respectively. Clamping member 238 of each block 232 and 234 is pivotally connected to a respective block and to clamp linkage member 244 and 246. The latter members are each pivotally connected to a linkage bridge 248 for linking members 244 and 246 in spaced relation. Linkage bridge 248 is connected to a cylinder piston 250 which, in turn, is connected to cylinder 252. Cylinder 252 is mounted to support 212. As illustrated in Figure 11, the bag 32a is of the type having equivalently sized panels.

[0052] A cam follower 254 is positioned beneath support 212 within an elongate race 256 in support 212. A race pin 258 extends from cam follower 254 through support 212 and pivotally connects first and second cam follower linkages 260 and 262. The linkages 260 and 262 are, at opposite ends thereof, pivotally connected to a respective parallel linkage 224 and 230.

[0053] Returning to reference to Figure 9, carousel skirt 214 includes a fixed horizontal generally crescent shaped cam 264 with a cammed surface element 266. The cam is positioned in horizontal relative to hoppers 60. The horizontal cam 264 is positioned to actuate the clamping assembly 210 for specific operations of the bag opening, filling and unloading stages of the process. Reference will now also be made to Figures 12a through 13d for the operation of the overall procedure.

[0054] Figure 12a illustrates a clamping assembly 210 where no bag has been loaded into the assembly and can be referenced on Figure 9 as stage S1. At this point, the cam follower 254 is against horizontal cam 264 to impede motion of the cam follower toward the center of the carousel, denoted C. As illustrated, the clamping members 238 are in the open position. As the assembly 210 is rotated to position S2 of Figure 9, bag selector 204 positions a bag 32a between clamping members 238 and 236. This is illustrated in Figures 12b, 13a and 13b. During this operation, the cylinder piston 250 is partially retracted, thus drawing linkage bridge

248 inwardly towards support 212 and accordingly pulling clamp linkage members 244, 246 also inwardly to induce the clamping motion of members 238 as shown. Cam follower 254 remains in contact with horizontal cam 264.

[0055] Turning to stage S3 of Figure 9 and with reference to Figures 12c and 13c, cam follower 254 is completely out of contact with horizontal cam 264. This results in the cam follower moving toward the center C of the carousel. As is evident from a comparison of Figures 12b and 12c, the cam follower 254 has moved within race 256 which transmits force to the cam follower linkages 260 and 262. These linkages cause the parallel linkages 224, 226 and 228, 230 to move toward each other to thus induce a slackening in the bag 32a to open the mouth of the bag 32a. An additional suction cup 207 may optionally be provided to assist in opening the bag 32a. The cylinder piston 250 is retracted partially further during this operation.

[0056] Once the bag 32a is open, further rotation of the assemblies 210 to stage S4 results in the charging of the bag 32a with the selected commodity (not shown). This stage involves the lowering of the hopper 60 (Figure 8) into position in a similar manner to that discussed with respect to Figures 1 through 7 and therefore will not be repeated here.

[0057] Upon completion of the charging stage, the charged bag is advanced to stage S5, where a cammed surface 266 on horizontal cam 264 contacts cam follower 254 while cylinder piston 250 is still retracted. This is shown in Figures 12d and 13d. This results in the parallel linkages 224, 226 and 228, 230 being spread apart from one another. Further advancement of the assembly 210 causes the cam follower linkages to be completely spread apart to stretch the bag into a closed position and also assisting in forcing any air out of the charged bag 32a.

[0058] Once stretched, the bag 32a may then be sealed (not shown) and piston 252 fully opened, stage S6, to release the clamping members 238 and facilitate removal of the charged and sealed bag (not shown). The procedure is then repeated at stage S1 with a new bag 32a.

[0059] In both embodiments of the apparatus, the procedure is continuous and sequenced with respect to bag selection, opening, filling, closing and sealing.

[0060] Where cylinders have been indicated as components in the structure, it will be appreciated that such cylinders may be fluid, electrical or other suitable sources of power. Further, in place of the cylinders, other means capable of achieving the same function may be employed, such as spring arrangements. Finally, the charged and closed bags may be sealed using any suitable apparatus known in the art.

[0061] Although embodiment of the invention have been described above, it is not limited thereto and it will be apparent to those skilled in the art that numerous modifications form part of the present invention insofar

as they do not depart from the spirit, nature and scope of the claimed and described invention.

Claims

1. An apparatus for charging a commodity into a pre-made open bag and closing said bag when charged, characterized in that said apparatus includes:

a rotatable carrousel;
 a plurality of hoppers (60) movably mounted to said carrousel;
 bag handling means (34, 36, 38, 210) mounted to said carrousel for gripping a bag (32a), opening said bag and closing said bag when charged with said commodity; and
 cam means (104) mounted to said apparatus along which said hoppers (60) move for relative movement between a hopper (60) and a bag (32a) having an open mouth to be charged with said commodity.

2. The apparatus as set forth in claim 1, characterized in that said cam means (104) comprises a vertical cam having a profile of varying height.

3. The apparatus as set forth in claim 2, characterized in that said hoppers include a cam follower (100, 102) for guided movement along said profile of said cam.

4. The apparatus as set forth in claim 3, characterized in that said bag handling means includes a movable arm (34) for selecting a bag by suction and clamping means (52, 54) for clamping a selected bag.

5. The apparatus as set forth in claim 4, characterized in that said bag handling means includes bag opening means having a movable arm (70) with suction for engaging a panel of a clamped bag to be opened.

6. The apparatus as set forth in claim 5, characterized in that said bag comprises a wicket type bag having a leading top edge.

7. The apparatus as set forth in claim 5, characterized in that said bag comprises a bag having equivalently sized panels.

8. An apparatus for charging a commodity into a pre-made open bag and closing said bag when charged, characterized in that said apparatus includes:

a frame (F);
 a rotatable carrousel mounted for rotation on said frame;

a plurality of hoppers (60) movably mounted to said carrousel;

bag handling means (210) mounted to said carrousel for gripping a bag, opening said bag and closing said bag when charged with said commodity;

actuation means (264) connected to said frame (F) and operative with said bag handling means (210) for actuating said bag handling means in a predetermined sequence for gripping said bag, opening said bag and closing said bag; and

cam means (104) mounted to said apparatus along which said hoppers (60) move for relative movement between a hopper (60) and a bag (32a) having an open mouth to be charged with said commodity.

9. The apparatus as set forth in claim 8, characterized in that said bag handling means includes a pair of clamping members (232, 234) each having a movable clamp member (238) and a fixed clamp member (236), said movable clamp member (238) movable relative to said fixed clamp member (236).

10. The apparatus as set forth in claim 8, characterized in that each said movable clamp member (238) is pivotally connected to a cylinder piston (250) for movement between clamping and non-clamping positions.

11. The apparatus as set forth in claim 9, characterized in that each said fixed clamp member (236) is pivotally connected to a support (212), said piston (250) being connected to said support (212).

12. The apparatus as set forth in claim 9, including a cam follower (256) movably mounted to said support (212).

13. The apparatus as set forth in claim 12, including linkage means (244, 246) pivotally connected to each said fixed clamp member (236) and said cam follower (256).

14. The apparatus as set forth in claim 13, characterized in that said linkage means (244, 246) is connected to each said fixed clamp member (236) independent of said cylinder piston (250).

15. The apparatus as set forth in claim 9, characterized in that said actuation means comprises a horizontal cam (264) mounted to said frame.

16. The apparatus as set forth in claim 15, characterized in that said horizontal cam (264) comprises a crescent shaped cam, said horizontal cam (264) for guiding said cam follower (254) during a portion of

rotation of said carrousel, whereby during contact of said follower and said cam said bag is closed by stretching.

17. The apparatus as set forth in claim 8, characterized in that each said movable clamp member (238) is connected to spring means. 5
18. A method of filling a pre-made bag with a commodity employing a rotatable carrousel with hoppers on a filling apparatus, characterized in that said method includes the steps of: 10
- a. providing a pre-made bag (32a) for charging with a commodity; 15
 - b. providing bag handling means (210) for gripping a bag, opening said bag and closing said bag to be charged with said commodity;
 - c. charging said bag with said commodity by relative movement between a hopper (60) and a bag having an open mouth to be charged with said commodity; and 20
 - d. closing said bag.
19. The method as set forth in claim 18, further including the step of providing a first cam (104) in a parallel relationship with said hoppers (60) on said apparatus for effecting said relative movement between said hopper and said bag. 25
20. The method as set forth in claim 18, further including the step of providing a second cam (264) in a horizontal relationship with said hoppers (60) for effecting said closing of said bag. 30
21. The method as set forth in claim 18, characterized in that said method is a continuous sequenced method. 35

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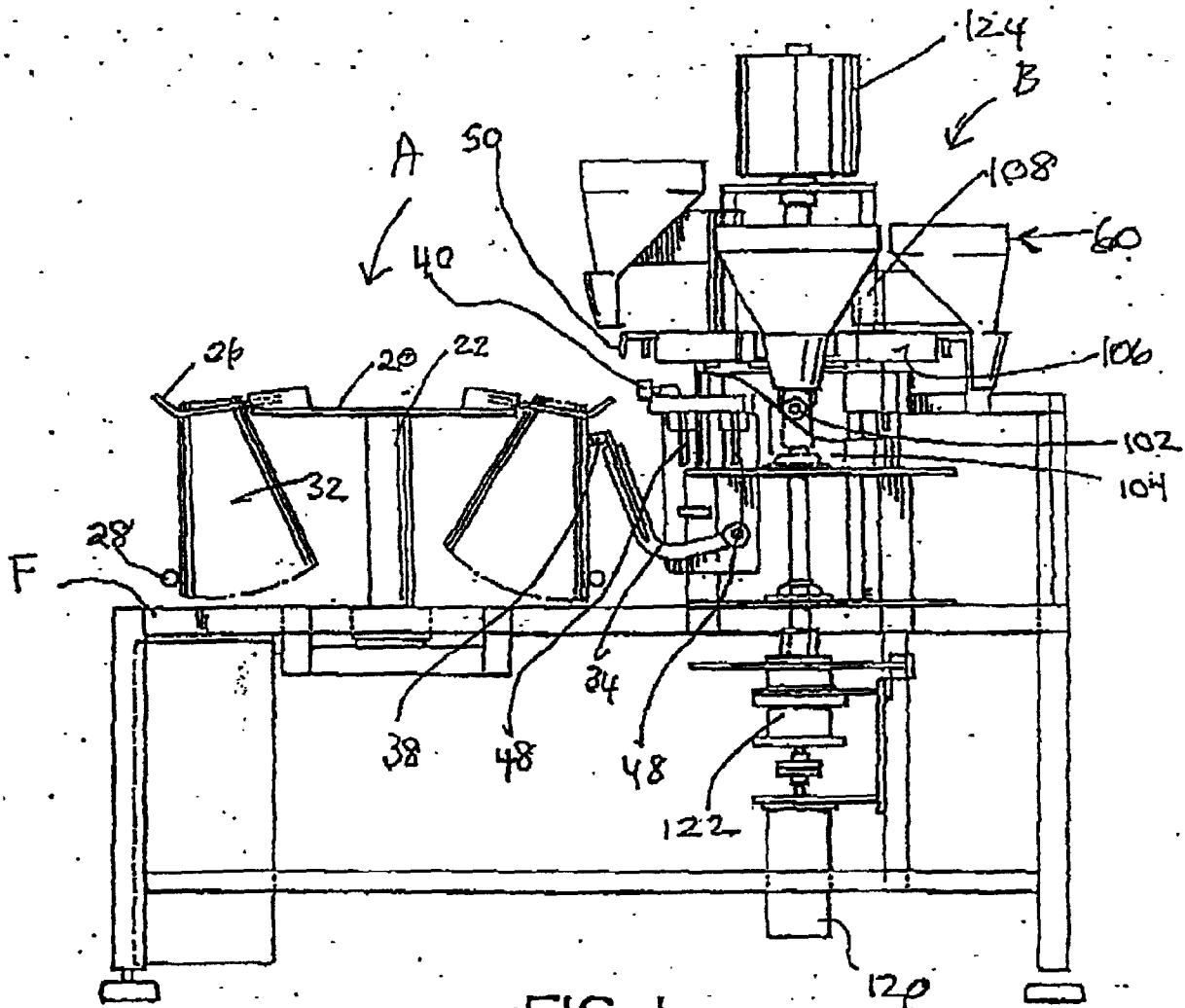


FIG. 1

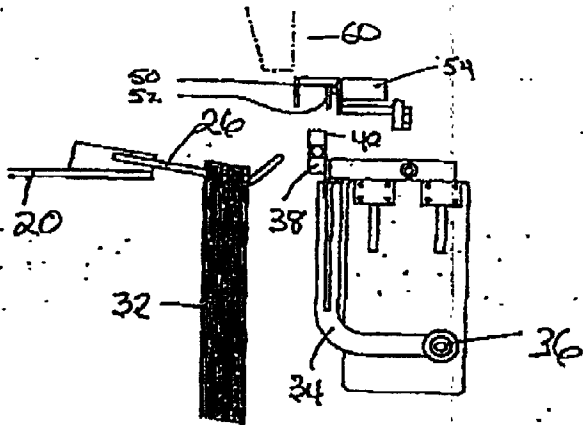


FIG. 3A

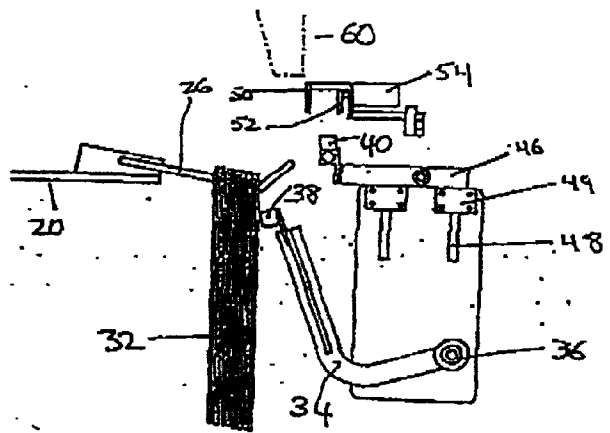


FIG. 3B

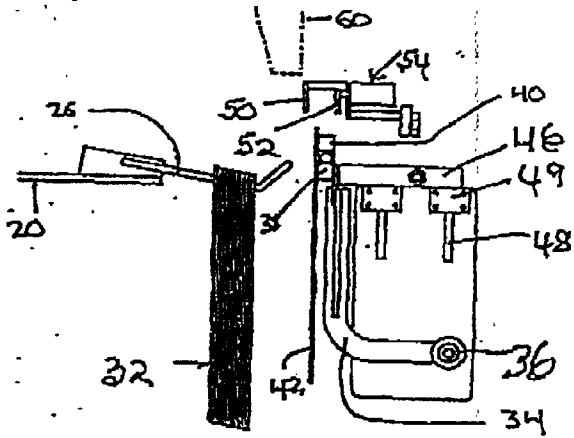


FIG. 3C

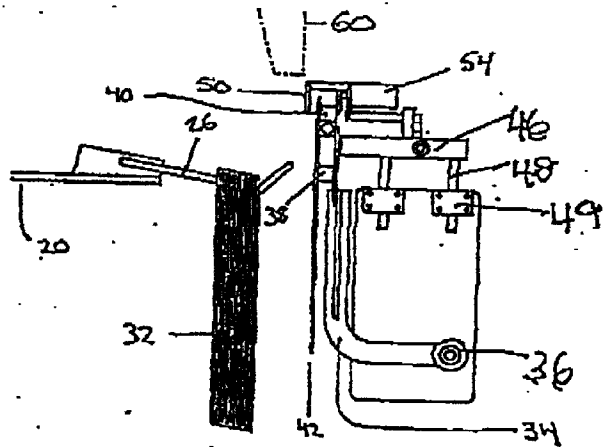


FIG. 3D

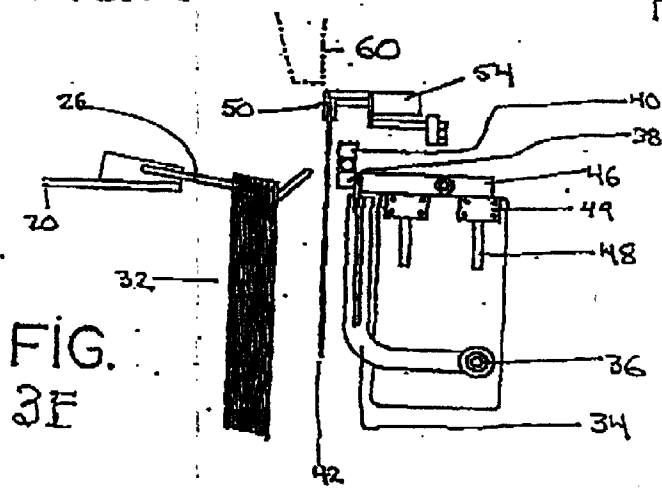


FIG. 3E

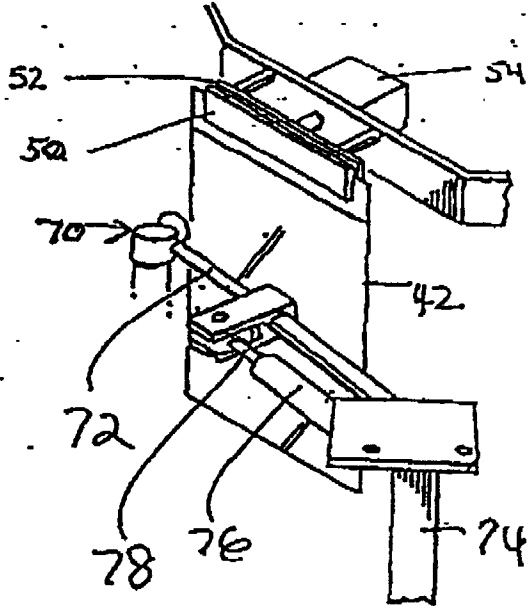


FIG. 4A

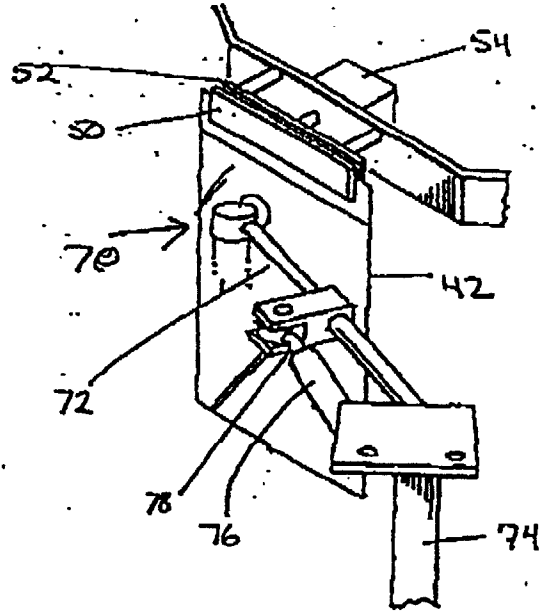


FIG. 4B

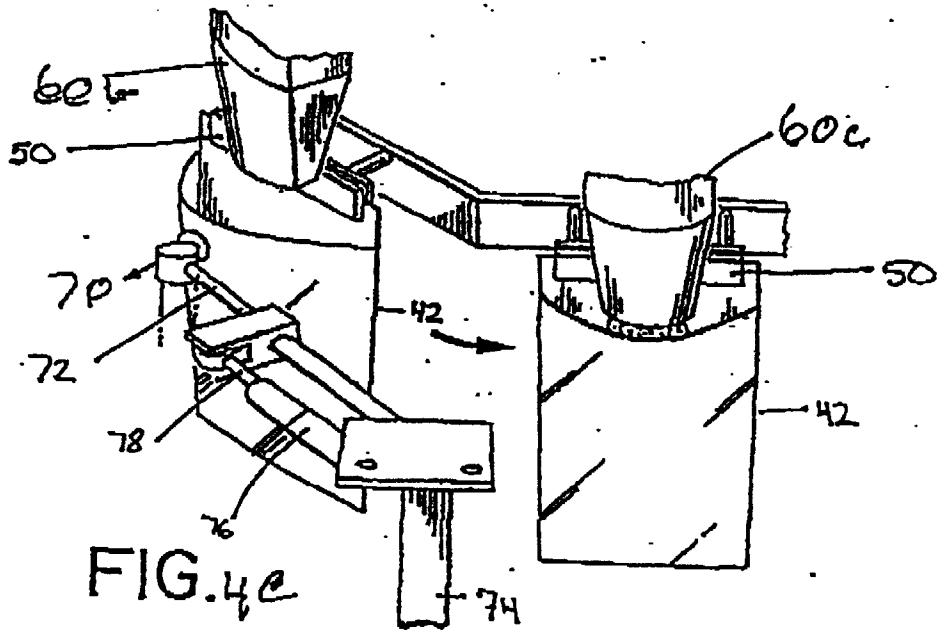


FIG. 4c

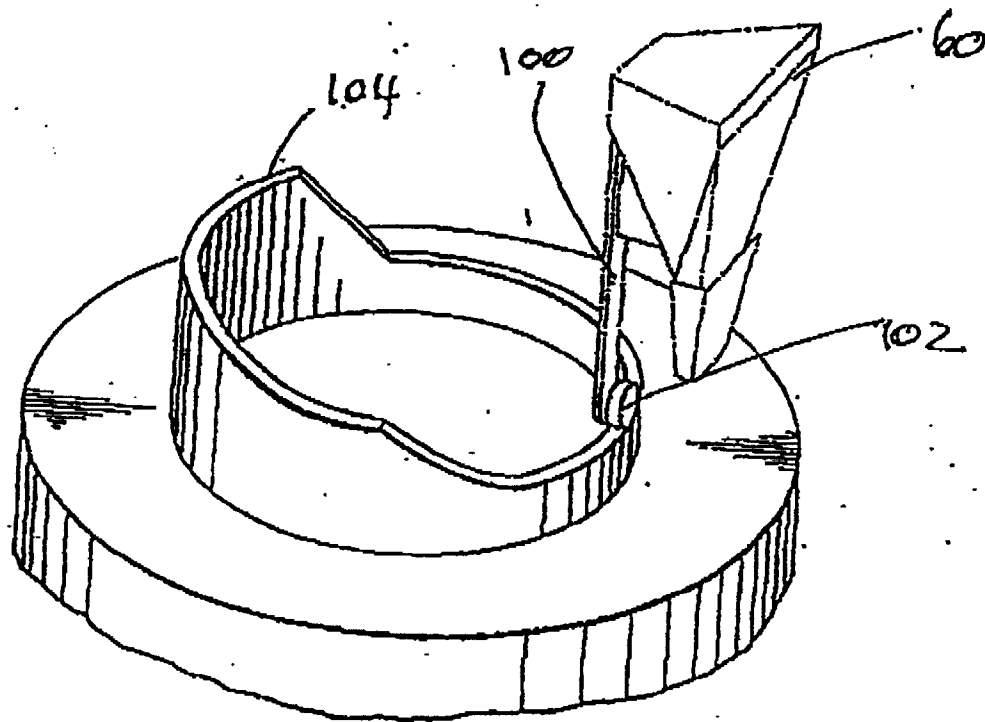


FIG. 5

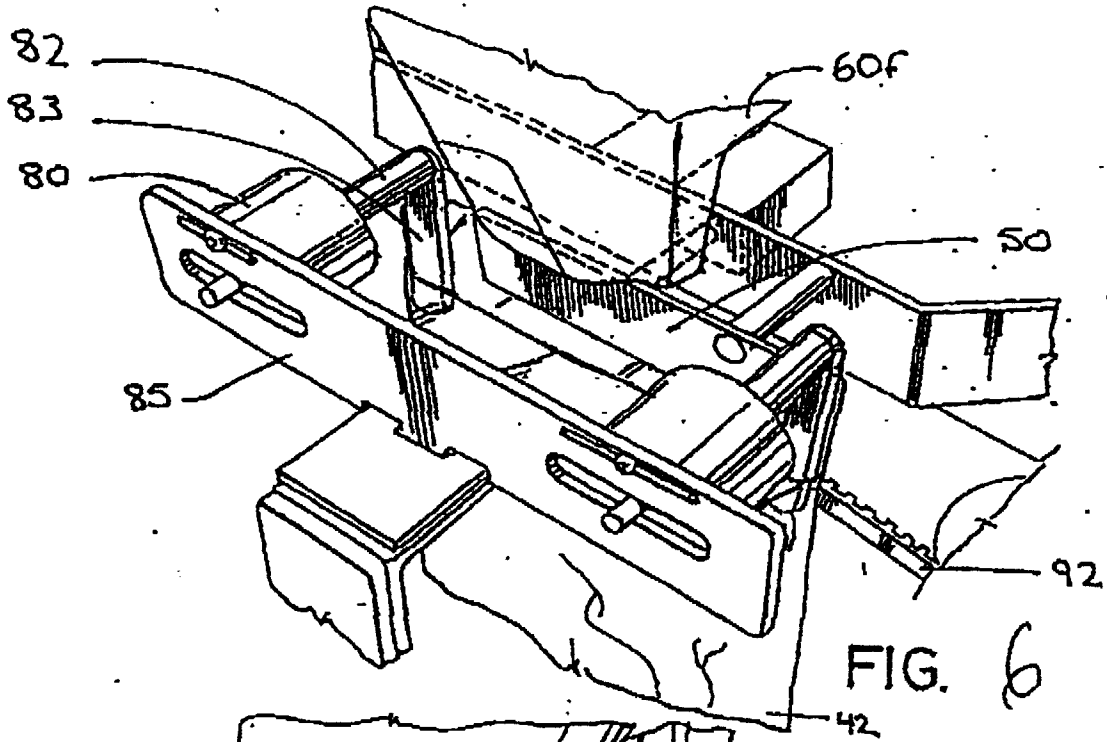


FIG. 6

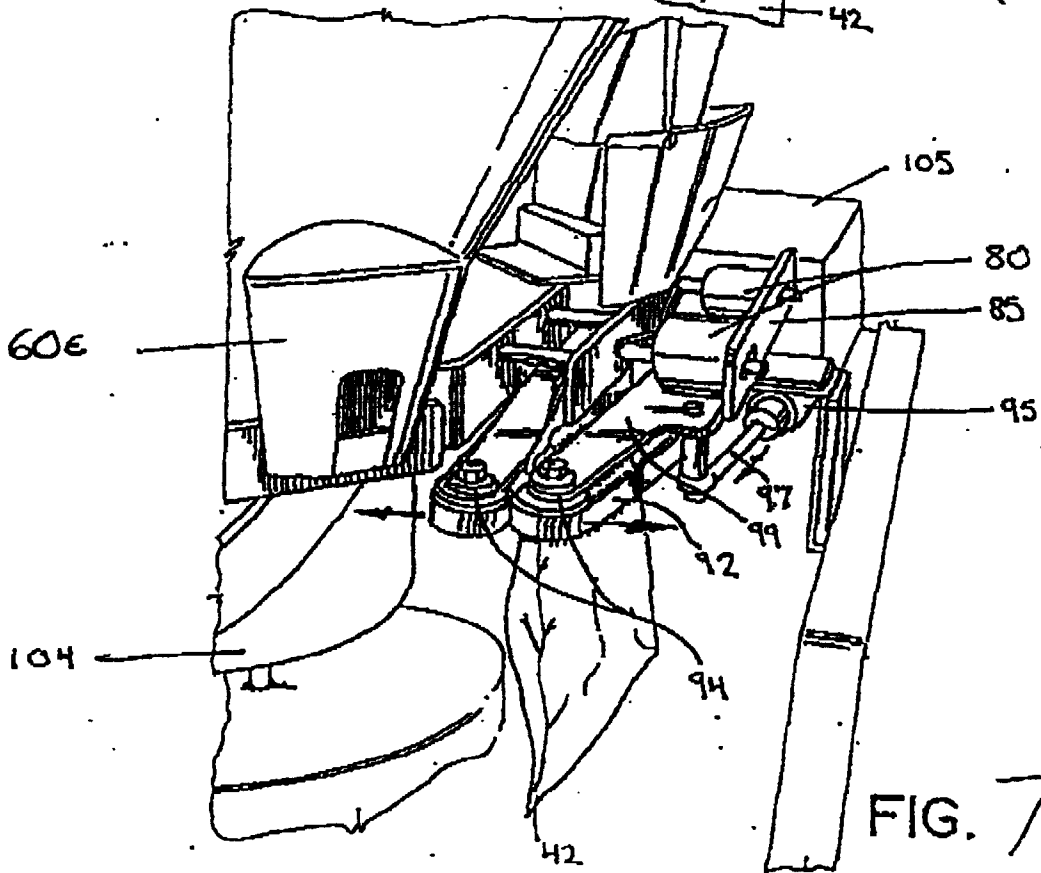


FIG. 7

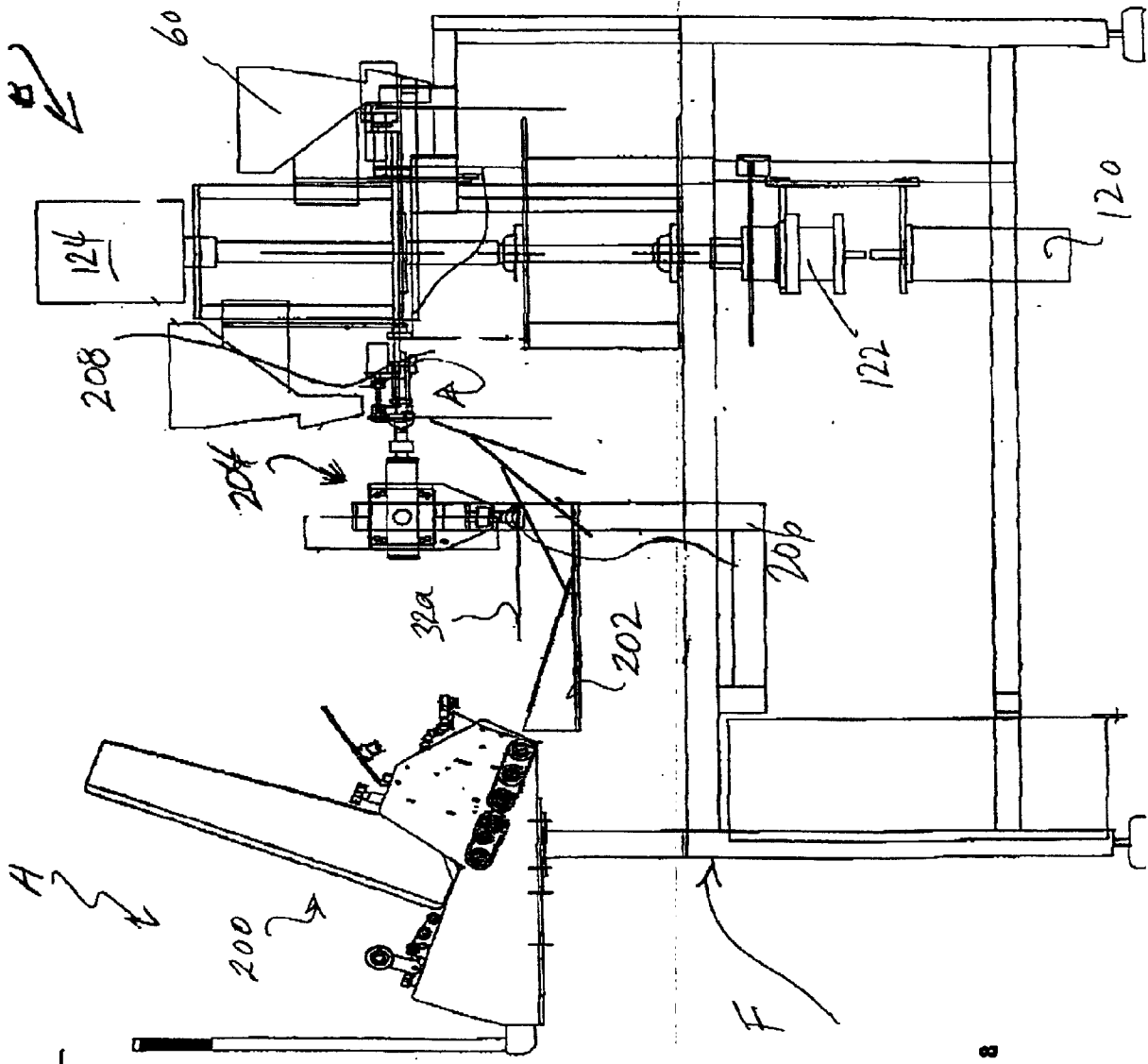


Figure 8

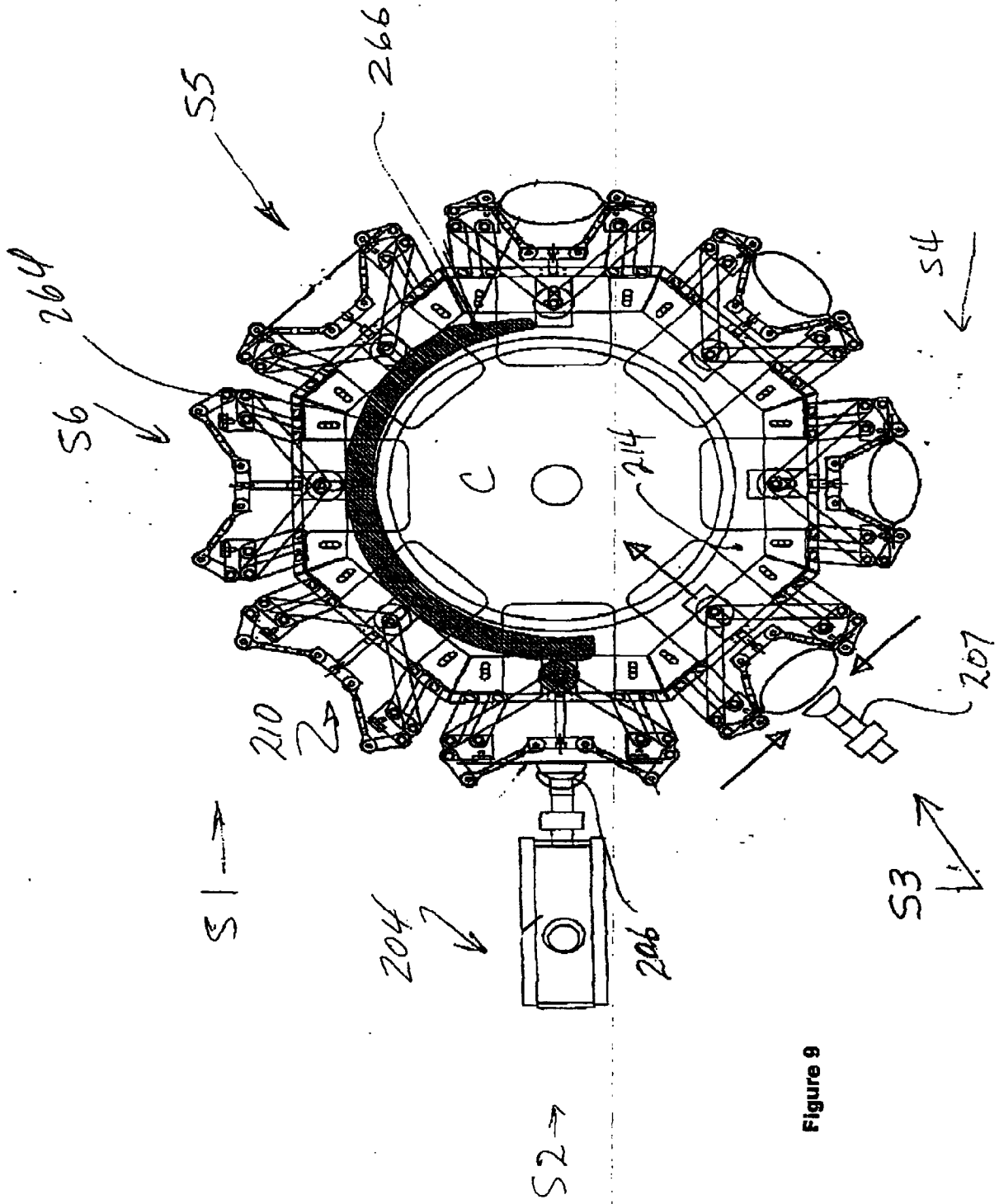


Figure 9

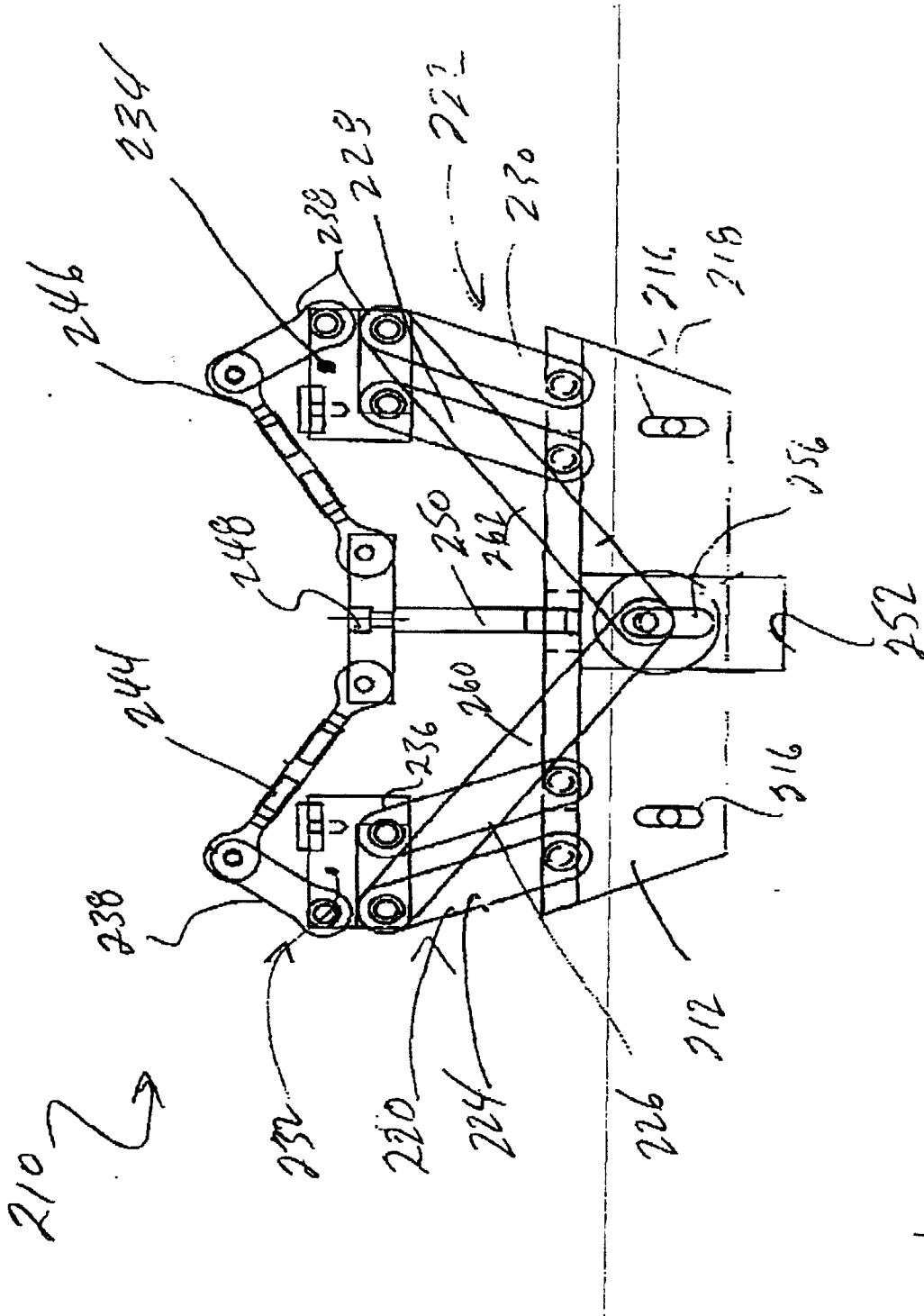


Figure 10

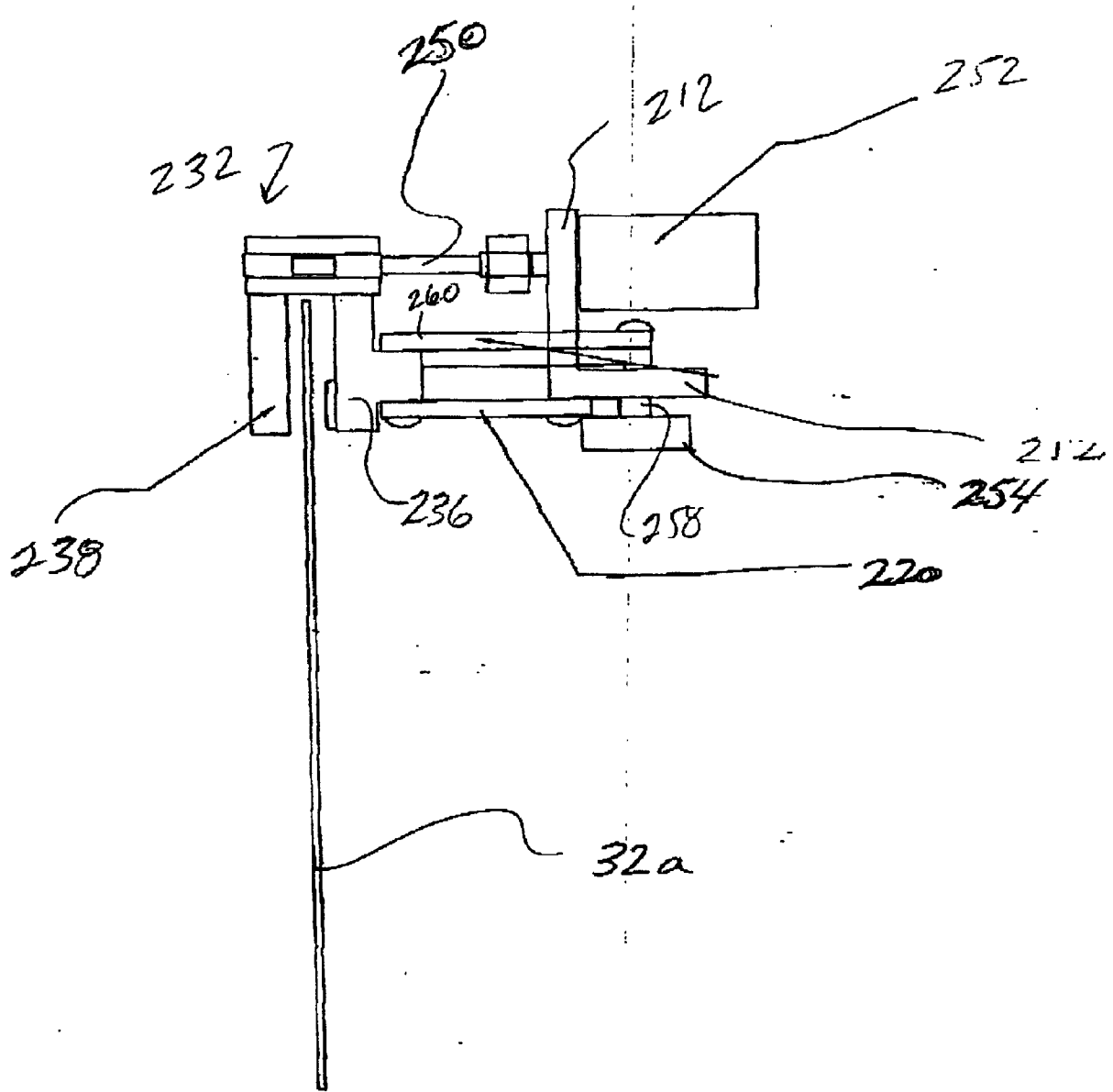


Figure 11

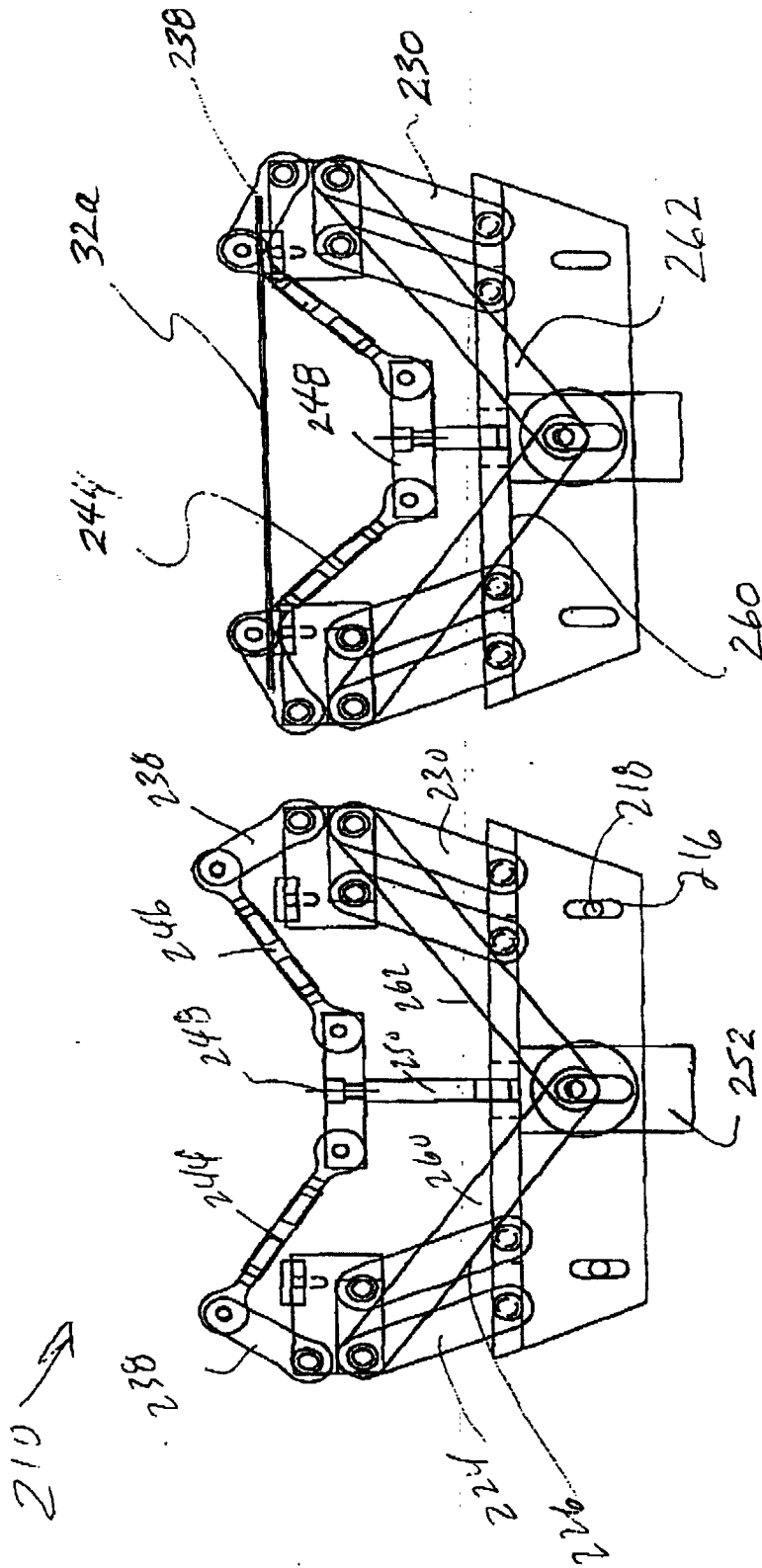


Figure 12b

Figure 12a

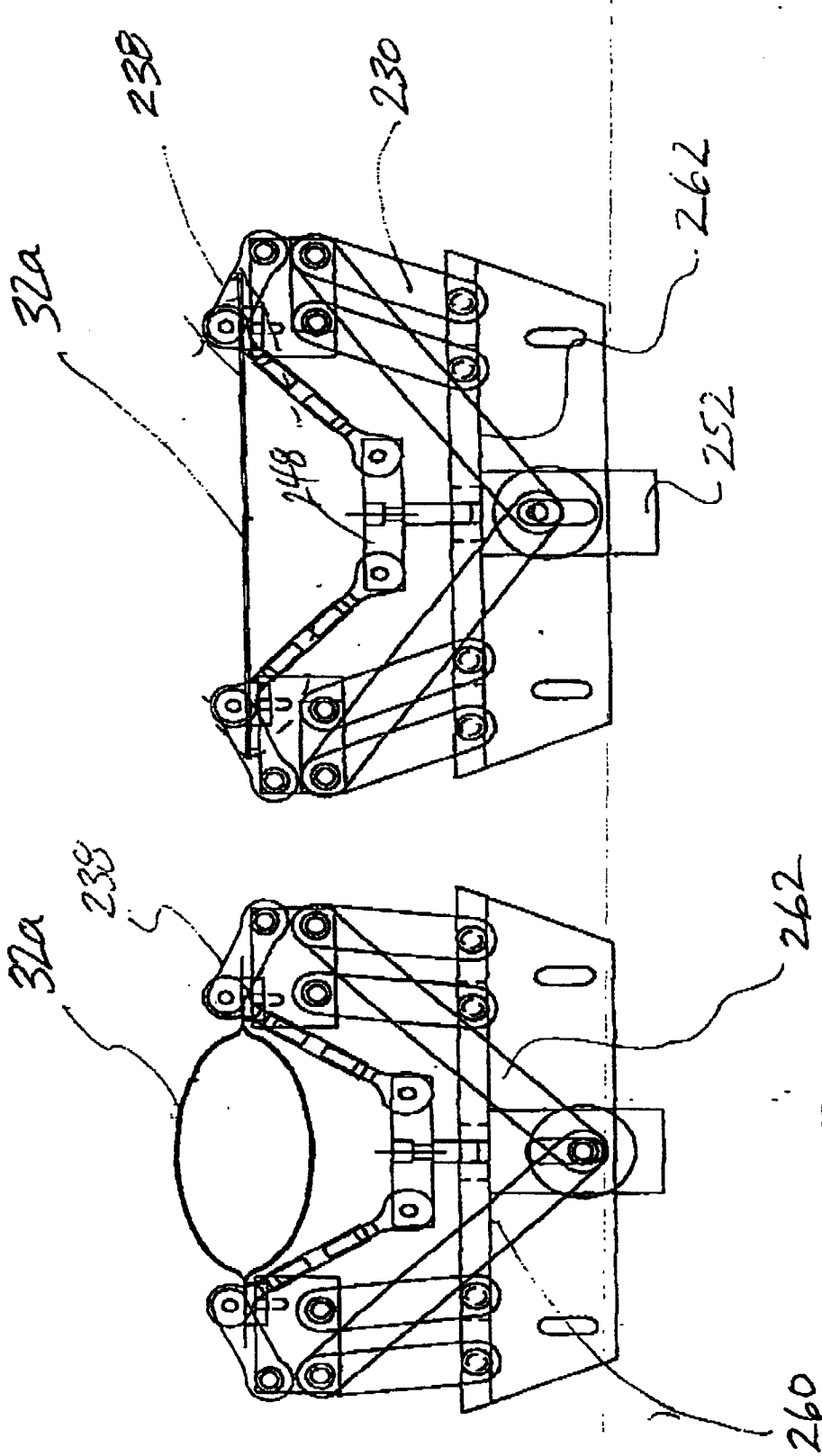


Figure 12d

Figure 12c

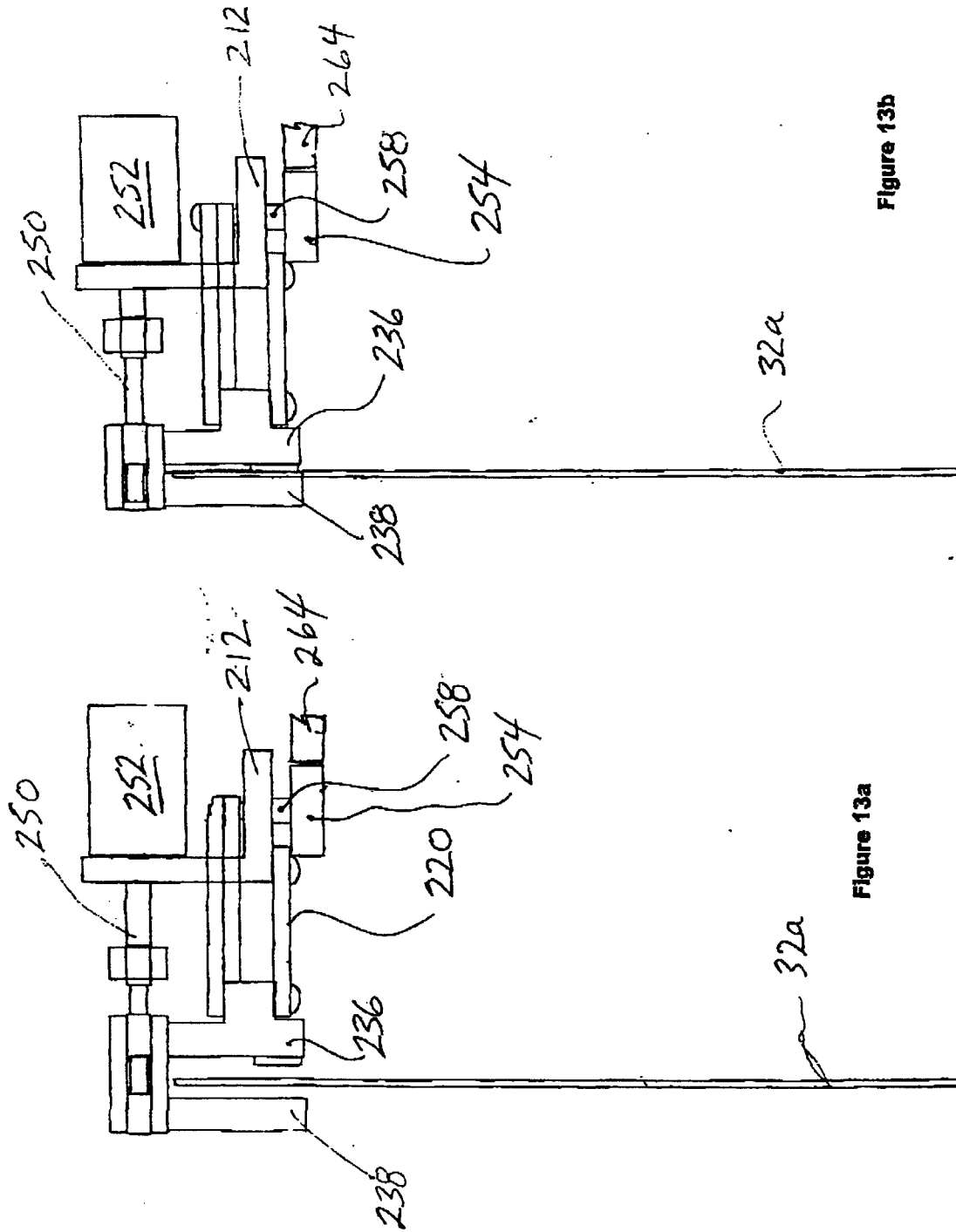
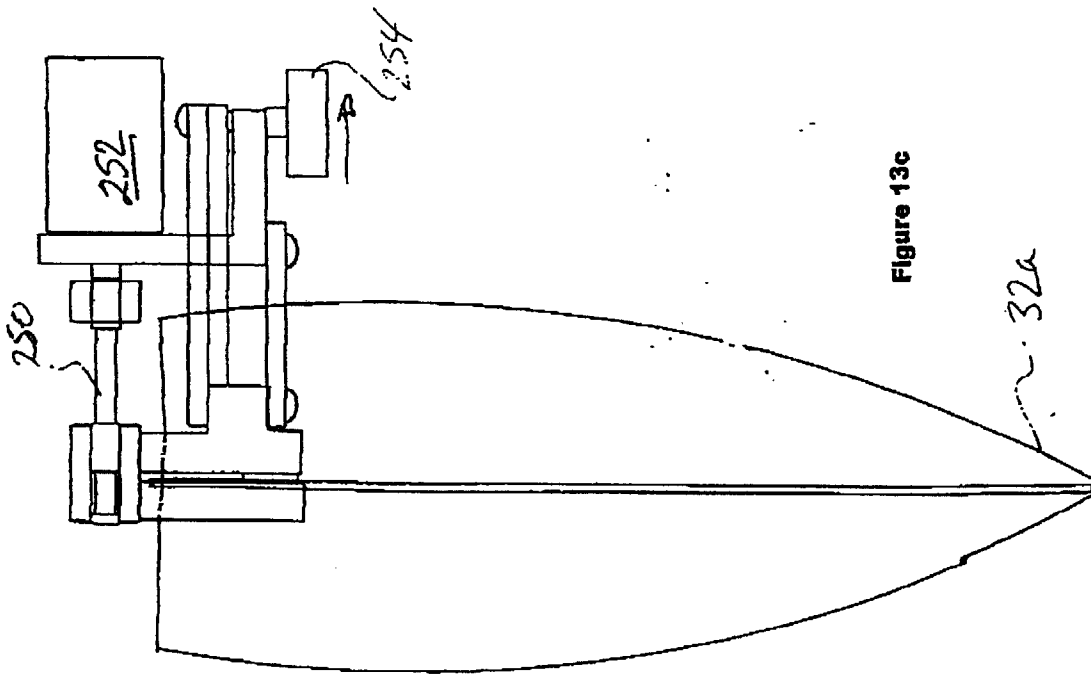
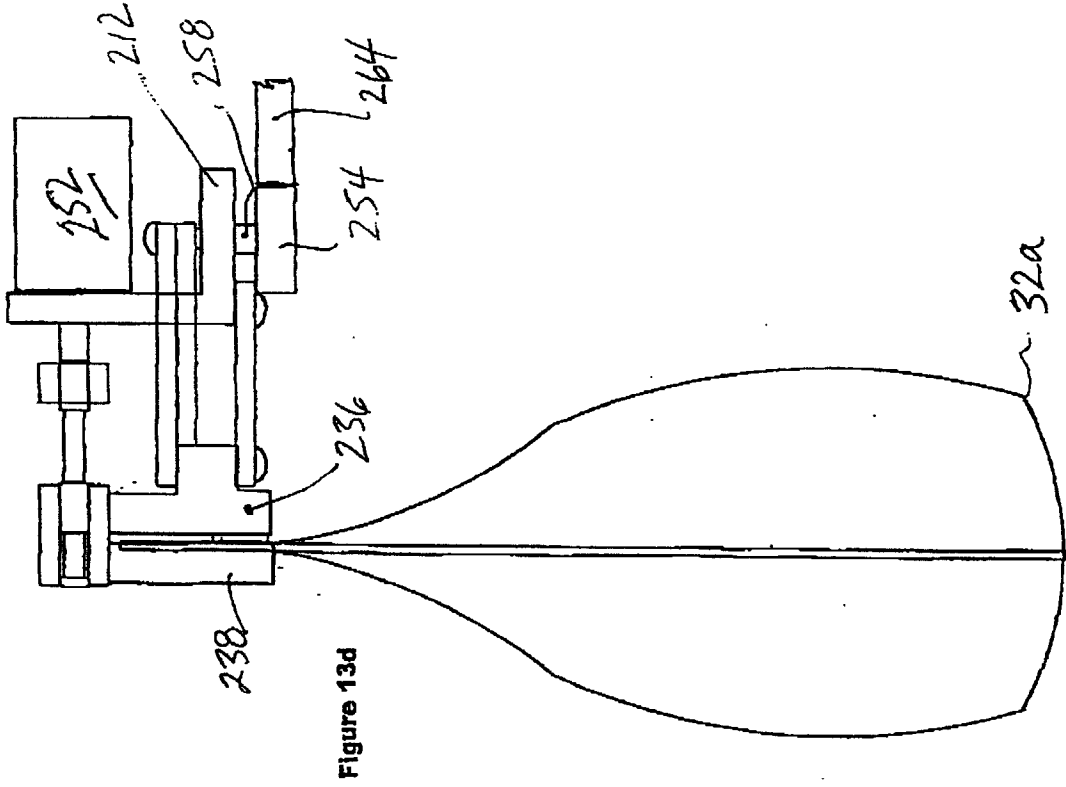


Figure 13b

Figure 13a





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 8227

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE 12 24 656 B (CENTRA ANSTALT)	1-3,8, 15,16, 18-20	B65B43/46 B65B43/60
Y	* column 3, line 57 - column 7, line 18; figures *	4,5,7, 9-14,17, 21	
Y	FR 2 650 807 A (THIMONNIER SA) 15 February 1991	4,5,7, 9-14,17	
A	* page 3, line 23 - page 5, line 34; figures *	15	
Y	US 5 001 889 A (MUELLER ALAN C) 26 March 1991	21	
A	* column 3, line 20 - column 8, line 49; figures *	1-3, 8-11,18, 19	
A	US 5 182 898 A (TUNG FU-CHING ET AL) 2 February 1993		
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 January 1999	Examiner Jagusiak, A
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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