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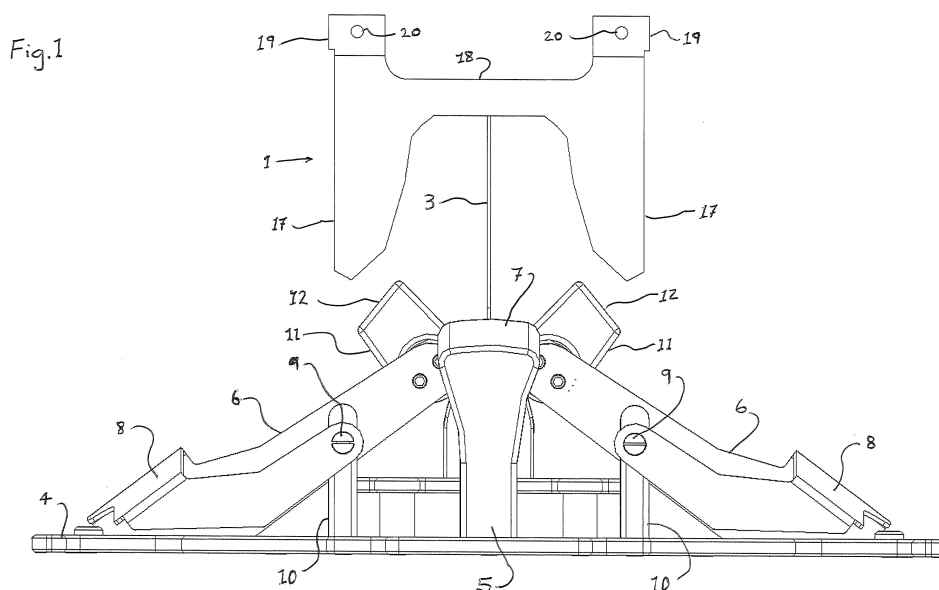
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(54) **Apparatus for supporting a media stack in a media feeding device**

(57) Apparatus for supporting a media stack in a media feeding device comprising,
a cam member (1) providing at least one cam surface (22);
a support member (2) including a base (4) and a plurality of support surface members (5, 6) mounted on the base (4), each support surface member (5, 6) providing at least one support surface (7, 8), the support surfaces (7, 8) in combination providing a base terrain profile for supporting a stack of media to be fed by a pick up mechanism,

at least one of the support surface members (5, 6) being a pivot able arm (6), and at least one of the support surface members (5) being fixed relative to the base (4);
wherein at least one pivot able arm member carries a cam follower (11), and the base terrain profile provided by the support surfaces (7, 8) is variable by virtue of the action of said cam follower cooperating with a corresponding cam surface (22) of the cam member (1) during a media feed operation.



Description

FIELD OF THE INVENTION

[0001] The invention relates to a media feeder for use with apparatus such as an image forming apparatus. In particular, the invention relates to a media feeder for feeding folded media articles such as envelopes.

BACKGROUND

[0002] Media feeders are combined with photocopiers and multifunctional devices (MFPs) or any other device that processes sheet and sheet like articles and requires a feeder to supply the articles for processing. Media feeders are generally capable of feeding different types of media articles, including different sizes and weights of media stock, as well as paper articles such as envelopes, but also other folded paper articles such as folders. Other materials may be used instead of paper, including, but not limited to paper, plastic, magnetic, film etc. The use of the term 'media' in the present application is, therefore, to be understood in the generic sense to include any such articles in whatever form and of whatever material.

[0003] Media feeders generally include one or more media trays. If there are plural media trays then these tend to be used for different stocks, for example, different sizes of paper or headed and non-headed paper, for example. Regardless of the presence of plural trays, each tray is normally able to receive and feed the full range of media articles. Each media tray, or the tray if there is only one, can usually receive, and supply to the feeding mechanism any media stock that the feeder mechanism is able to handle. For instance, if the feeder mechanism is intended to handle both paper sheets and envelopes than the, or each, tray of the machine can supply both paper sheets and envelopes to the feeder mechanism. Furthermore, the, or each, tray can normally handle paper stock or other media of different sizes. Such media trays generally have one or more moveable fences, also known as a paper guide or lift guide.

[0004] Whilst the present invention relates generally to the field of media feeders for feeding folded paper articles such as envelopes, the trays for these feeders are generally called "paper trays" regardless of the stock which they are adapted to contain. The term "paper" used herein is not intended to be limiting either with regard to the type of stock or the material from which the stock is made. Any reference to paper feeder or paper article should be similarly understood not to be restricted to paper or even to a strictly sheet like material.

[0005] JP-A-2005320084 discloses an envelope feeding device used in a stencil printing machine capable of precluding a miss-feed and wrinkling of a flap, in the case where stacked envelopes are fed one by one from the uppermost one. The envelope feeding device is equipped with an envelope feeder table capable of elevating and sinking on which envelopes with their flaps folded up are

stacked and side guides installed on the sides in the width direction perpendicularly intersecting the envelope transporting direction for restricting the sides of the stacked envelopes. The arrangement includes an air suction type transporting mechanism installed over the feeder table for transporting the uppermost one of the stacked envelopes by attracting through air sucking and a deterring member which has a deterrent surface located approximately on a level with the transporting undersurface of the air suction type transporting mechanism and is positioned in the rear about the transporting direction of the transporting mechanism. The stacked envelopes are pinched by a constant pressure in the vertical direction between the transporting surface of the transporting mechanism and the deterrent surface of the deterring member and the feeder table so that the envelopes are held approximately in the horizontal attitude.

[0006] JP-A-2003146462 discloses a paper feeder for preventing generation of a wrinkle in a thin sheet, and to prevent a feeding failure in the case of an extremely thick sheet such as an envelope or a private postcard. In this paper feeder, a separating means is provided on the upstream side of a main separation means having a main separation member contacting with a paper feeding roller. The separating means has a base member slidably supported by a bracket, a separating plate held on the upper face of the base member and pressed to the peripheral face of the paper feeding roller by a prescribed pressure, and a spring as an energizing means pressing the separating plate to the paper feeding roller through the base member, or the like. A gap is formed between the separating plate and the main separation means over a movable range of the separating plate.

[0007] US-A-2007120318 discloses a system and method of fully supporting, substantially planarly, a variable thickness stack of non-uniform thickness print media sheets on a single integral and substantially planar pivotal supporting tray which is automatically variably tilted in response to the height of the stack by being mounted on, and moved by, an existing elevator tray, the vertical movement of which automatically changes the pivotal tilt angle of the tray by a lever arm pivotal connection between the pivotal tray and a fixed position to maintain the top sheet of the stack substantially horizontal as the stack thickness changes while the elevator tray is simultaneously vertically moving the pivotal tray.

[0008] US-A-2007257419 discloses a leveling device that assists in support of stackable objects having a non-uniform thickness, such as DocuCards, in a stackable tray. The stackable tray includes a pivoting tray that can be pivoted from a full sheet stack position to an empty sheet stack position. A valley removal mechanism is provided on the pivoting tray to variably support an intermediate portion of the bottom of the stack to compensate for and remove a valley created intermediate ends of the stack due to an aggregate effect of stack media of non-uniform thickness. The valley removal mechanism preferably includes a support surface that contacts a bottom

of the stack, a ramp defining a ramp profile, and a ramp follower that guides the support surface to a variable orientation that compensates for the valley as the stack height changes. US-A-2007357419 solves the disclosed problem by providing a pivoting stack member that provides a continually reducing tilt to compensate for a non-uniform thickness media and a valley removal mechanism including a media support surface positioned above the pivoting tray, intermediate ends of the pivoting tray and below the stack, the media support surface supporting at least a portion of an intermediate section of the stack and being pivotally movable relative to the pivoting stack tray; a ramp surface having a predefined profile; and at least one lever arm operably connected between the media support surface and at least one ramp follower to move the media support surface relative to the pivoting tray in accordance with the ramp surface profile and in proportion to the height of the stack to offset a valley formed intermediate ends of the stack and provide a top media in the stack with a substantially flat top surface profile

[0009] US-A-2002084575 discloses a leveling device which is useful for paper having at least two different thicknesses for a paper supply tray having a given depth, for a sheet feeder, which comprises a support upon which the paper having at least two different thicknesses rests, wherein the support height is self adjusting to compensate for the different thicknesses of the paper such that a top sheet of paper is in a position to feed properly into the sheet feeder.

[0010] US-A-2011101603 discloses a lifting unit and a process for lifting a stack of sheets having at least a first support and at least a second support. The first support defines a first contoured or flat support surface, and the second support defines a second support surface which has a substantially horizontal, flat main surface. In the lifting unit at least one unit is provided for lifting the first and second supports. During operation the supports are lifted such that at least a highest point of the first support is kept elevation ally above the second support, the second support is lifted more quickly than the first support, and the substantially horizontal, flat main surface of the second support is kept in its horizontal alignment. The lifting unit is described, in combination with a sheet feeder.

[0011] US-A-6142689 discloses an envelope leveler for use with a printer feeder to orient a top envelope of a stack of envelopes to be fed into a printer attached to the printer feeder. The envelope leveler includes a platform upon which the envelope stack is disposed, a base, and a pivot for rotating the platform and the envelope stack thereupon about the base such that the top envelope of the envelope stack is oriented for proper feeding into the printer. Also provided is a printer having the envelope leveler. The printer comprising, a printer feeder having a surface for supporting the stack of envelopes, a feeder for feeding the top envelope into the printer, and the above envelope leveler.

PROBLEM TO BE SOLVED

[0012] Media articles having a localised variation in thickness such as envelopes and other folded articles provide a challenge to conventional media feeders since they do not stack perfectly flat. Where a media stack has an uneven height due to the form of the media, such as envelopes, the top media item may not be presented with a sufficiently straight edge (the plane of the upper sheets should also be substantially flat (in most cases meaning horizontal) meaning at least the edge portion of the upper most media article is in the plane of the mouth (input port) of the feed mechanism or pick up. In particular, for envelopes, the thickness of the folded edges causes the height of the stack at the ends of the media to be higher than in the middle. A large stack of envelopes on a flat surface will have a valley in the middle. In other words the leading edge must be aligned with the input port of the feed mechanism.

[0013] If a larger number of envelopes than a maximum are stacked in a tray of a media feeder then the top media article will not be presented flat to the pick up system and the media feeder will not work possibly causing a jam. In a known conventional feeder having a Large Capacity Tray (LCT) the stacking quantity of a C4 type envelope might be limited to approximately 30 of 100 or 120 g envelopes due to the thickness of envelopes at the media pick up point. In other words, even though a stack of envelopes may not present the top envelope sufficiently horizontal at the leading edge, if the stack is sufficiently small the deviation from the horizontal, of the leading edge of the top envelope, will be sufficiently small as to allow safe feeding by the feeding mechanism.

[0014] At low numbers, the difference in height might be manageable in a conventional feeder; as stated above a conventional LTC quantity for C4 envelopes might be 30. Above that number the above unevenness in stack height causes a non-flat edge profile to be presented by the top media item causing possible mis-feed. This quantity is inefficient for production print customers.

[0015] By "non-flat edge profile" is meant that either the edge profile is not straight (deflects from straight outside the tolerance for the particular pick up mechanism) or the plane of the leading edge (the edge being fed to the mouth of the pick up mechanism) of the media item is angled outside the tolerance of the mouth of the pick up mechanism - generally this will mean that the place of the edge is not substantially horizontal. Thus, a flat edge profile will have an edge that is substantially straight (does not depart from the axis by more than a predetermined amount) and at least a portion of the edge back from the leading edge will be substantially in the plane of the mouth of the pick up mechanism (generally that will be horizontal).

[0016] In a friction type pickup mechanism, a pick up roller is arranged to press on the top media item at (a central portion of) the leading edge. Typically there is a single pick up roller located at a central position, but of

course there may be any number of rollers located in various positions. Air blowers are usually arranged proximate the top of the stack to separate the edges of the media items at the top of the stack.

[0017] When presenting, for example, a C4 envelope to a feed mechanism with the long flap edge presented to the feed mechanism and the flap facing down towards the tray floor, the ends of the stack at the leading edge will be higher than the centre, that is for a large stack of envelopes there is a tendency for the stack to sag in the middle. The pressure of the roller on the top of the stack increases the pressure on the edges of the stack which cannot be overcome by the air assist separation blowers. On the other hand, if there is insufficient resistance at the location of the roller or rollers then there will not be sufficient friction for the pick up roller to function. To be clear, there may be no correct pressure at which the feed mechanism will work.

[0018] There are generally two different variations to compensate for when feeding envelopes; the above mentioned problem caused by the thicker edges and the difference in height of the stack due to the envelope flap. Similar problems can occur in other media having localised thickness variation.

[0019] The specific issue before the inventors was how to increase the maximum number of, for example, envelopes that could be loaded into a media tray, such as an LCT, and still maintain proper feeding of the media articles. The problem can be extended to other forms of folder media articles or folded articles of materials other than paper and relates to any tray of a feeding mechanism for feeding articles, such as paper sheets, to a feeding mechanism. Sheet fed media articles that might suffer from variations in stack height include, for example, envelopes, folders, DocuCards (an example of a sheet having a label or card affixed thereto), PIN label media, etc.

SUMMARY

[0020] An object of the invention is to increase the number of sheet fed media articles that can be successfully fed from the input media tray of a media feeder, compared with a flat loading tray. In particular, where the sheet fed media articles are media articles having localised variable thickness. In particular, a retrofit solution to present feeders incapable of loading a full stack of articles and safely feed the entire stack without miss feeds. A retrofit solution can also be adapted to provide new devices that do not need a retrofitted mechanism but instead have the mechanism integral with the media feed tray.

[0021] The invention provides an apparatus for supporting a media stack in a media feeding device comprising, a cam member providing a cam surface; a support member including a base and a plurality of support surface members mounted on the base, each support surface member providing at least one support surface, the support surfaces in combination providing a base terrain profile for supporting a stack of media to be fed by a pick

up mechanism, at least one of the support surface members being a pivotable arm, and at least one of the support surface members being fixed relative to the base; wherein at least one pivotable arm member carries a cam follower, and the base terrain profile provided by the support surfaces is variable by virtue of the action of said cam follower cooperating with a corresponding cam surface of the cam member during a media feed operation.

[0022] The apparatus of the invention provides a simple solution to the problem of compensating for variation in stack height and valleys formed in large stacks due to media with localised thickness variation.

[0023] The at least one fixed surface support member may be centrally located so as to provide a raised central base terrain profile. The fixed surface support member provides a support surface that does not move relative to the base and therefore does not move relative to the media stack.

[0024] The support surface members may include two pivotable arm members and an intermediate fixed support surface member.

[0025] The pivotable arm members may be independent each carrying a cam follower cooperating with a respective cam surface. The movement profile described by the action of the cam followers on the cam surfaces of the cam piece may be the same or different.

[0026] Two or more pivotable arm members may be connected and there may be a single cam follower and a single corresponding cam surface for the connected pivotable arm member. There may be a single cam follower on one arm where the arms are connected. However, providing a cam follower on each of the arms allows the various forces to be distributed decreasing the extra load on the feed tray motor.

[0027] At least one support surface may describe a decreasing height above the base along a longitudinal axis thereof. A plurality of support surfaces may extend longitudinally along parallel axes and each of said surfaces may be at an angle to the base. The angle to the base is between 2 and 4 degrees, optionally approximately 3 degrees.

[0028] The base member may be a floor of a media input tray - for example when the apparatus is integral to the feed tray.

[0029] The base member may be an insert for media input feed tray, which can be removed when not required. The cam member may be removably mountable in the media input tray of a media feeding device and the cam member may be tethered to the support member.

[0030] The base terrain profile provided by the support surfaces is configured to compensate for variations in stack height caused by a media stack having media with localised thickness variation. The cam member and support member may be arranged such that an initial base terrain profile provided by the support surfaces is static for a predetermined depletion of the media stack and the cam surface of the cam member operates on the cam follower of the pivotable arm so as to decrease the

amount of compensation provided for variations in stack height caused by localised thickness variation of the media as the stack depletes beyond the predetermined level.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The invention will be described in more detail below, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a front elevation of apparatus according to the present invention including a support member and a cam piece;

Figure 2 is a side elevation of apparatus of figure 1; Figure 3 is a rear elevation of the apparatus of figures 1 and 2 in situ in a media feed tray and showing a portion of a back stop of the media feed tray;

Figure 4A, 4B and 4C are rear elevations of the support member of figure 1 in different configurations, together with a schematically shown stack of articles to be fed;

Figure 5 shows the dimensions and exemplary radii for curved portions of the design of the cam piece 1 of a specific example.

Figures 6 and 7 are a rear and side view of the jig in position in an LCT and indicates various exemplary dimensions.

DETAILED DESCRIPTION

[0032] An embodiment of the invention will be described with reference to a generic apparatus requiring a media feeder, such as a printer, photocopier or MFP.

[0033] A media feed tray comprises a tray floor that rises and falls independently of side walls on opposite sides which help to guide the media when loading and feeding. The tray is contained in a drawer in a housing of the apparatus. The drawer can be pulled open externally of the apparatus in order to allow ease of access for loading stock into the feed tray. One of more walls of the drawer may constitute a wall of the feed tray. The internal end of the tray is generally open; an internal wall of the apparatus may form the end wall of the tray when the drawer is closed.

[0034] In known media feed trays at least one of the side walls known as fences will generally be moveable to adjust the width or length of the stock to be fed from the feed tray. Alternatively, both side walls may be moveable and optionally the movement of one side wall effects a corresponding movement of the other side wall.

[0035] In the embodiment below a retrofit insert for an LCT manufactured by Ricoh is described. Details of the jig required to fit are therefore dependent on the arrangement of the particular tray and are not intended to limit the invention. Furthermore, this particular solution of the embodiment is intended for the C4 standard envelope and the specifics of the jig of the embodiment are con-

strained by the feeding dynamics for a stack of C4 envelopes; again this is not intended to limit the invention and modifications can be made in view of the feeding dynamics of other stock of different configurations, sizes and materials.

[0036] In the LCT of the embodiment the side fences are moveable, within the confines of the drawer, to adjust to the width of the media. The side fences house air assist separation units proximate the feed position.

[0037] The end of the tray, nearest the drawer handle, has a back stop (also known as a paper guide or lift guide) which is moveable in and out to effect a change of the tray size in a direction perpendicular to the two side walls. In other feeder trays the lift guide is one of the side fences.

[0038] The floor of the media tray rises under control of the LCT engine controller. During a feeding operation the tray floor will rise to present the top of the stack at a constant height as it is depleted. The tray floor moves relative to the side fences, the front wall of the tray, and the rear fence (sometimes called a back stop).

[0039] If the base terrain of a full stack (for example 1 box of 250 envelopes) could be manipulated so that the top feeding envelope (as an example of a media article) has a leading edge with a substantially flat edge profile for presentation to a pick up system, such as a friction feed or vacuum feed pickup system, then the top media articles in the stack will feed properly leaving a remainder of the stack that will not feed. For example, if the number of articles of the particular stock (e.g. C4 envelope) that can be safely fed from the LTC is 30 and the full stack comprises 250 media articles, then with a static modified base terrain it might be possible to feed around 100 media articles, i.e. 150 articles might be remaining in the stack if the base terrain were manipulated to present the top media article as flat to the pickup system.

[0040] For example, if a feeder can safely feed 30 envelopes from an initial stack of 30 without modification, then configuring the base terrain to take into account the sag in the larger stack and the uneven stack height, so that the top sheets of the larger stack present a flat leading edge, then the feeder would still only be able to feed a certain number of articles (about 100 C4 envelopes) before the static compensation of the profile of the base terrain distorts the depleted stack such that the articles at the top of the stack are no longer presented correctly to the feed mechanism.

[0041] The floor of a feeding tray is generally flat since mostly they are used to feed flat media sheets which can be easily stacked with consistently horizontal sheets from top to bottom. For non-flat articles, such as envelopes, the base terrain could be modified with a static insert or jig at the bottom of the tray presenting, for example, a raised central portion to the base terrain compensating for any sag. For an envelope of other media item with a folded portion at the leading edge (i.e. the edge presented to the pickup) the static base terrain could also compensate for the variation in height from the leading edge.

[0042] The inventors have appreciated that the entire

stack can be fed if the top articles in the stack can be kept 'horizontal' until the stack has been completely depleted. The uppermost article itself does not have to be horizontal in the sense of the plane of the article being along a plane defined by the longitudinal axis of the mouth of the feed mechanism. It appears to be important that the leading edge is substantially flat and parallel with the longitudinal axis of the mouth of the feed mechanism, that is, aligned with the feed mechanism input port.

[0043] The problems with the prior art can be overcome by a new base terrain of the media tray which is adapted to manipulate the orientation of the base of the stack such that the stacked media items at the feed pickup (the top of the stack) are presented at the correct orientation for the pickup as the stack is depleted. In other words, the profile of the edge of the item presented to the feed mechanism is sufficiently flat. There is a tolerance for the need for a flat edge profile, which will vary from device to device (dependent mainly on the feed mechanism). The tolerance is normally in the region of 2 to 5mm of deflection from a straight line between the ends of the edge being presented to the feed mechanism. The tolerance will depend on the particular feed mechanism.

[0044] In tests, it has been found that for an unmodified LCT (Ricoh model RT5010, RT5040, RT5020 and RT5050) can feed approximately 30 C4 envelopes. Loading a whole box of 250 C4 envelopes and modifying the base terrain such that the top of the full stack is 'horizontal' (the base terrain compensates for the sag and variation in height of the stack) allows all but 100 of the envelopes to be fed correctly. Thus an improved performance can be achieved by providing a base terrain profile (for example, by providing a retrofit insert) that provides support along a central line along the direction of feeding so that the top of a full stack lies more flat than would be the case if the stack were simply loaded into the empty tray. The sort of profile can be seen in figure 1. The jig of figure 1 has moveable arms but these are not necessary to provide some improvement.

[0045] The jig of figure 1, provides a base terrain having a convex profile that compensates for the sag in the stack between the edges of the folded media articles (in this case envelopes). A further improvement in performance is provided by designing the base terrain to compensate for a variation in height of the stack, for example, where the height of the stack is greater at the leading edge provided to the feed mechanism, by providing a base terrain profile that tilts the stack from back to front (where the 'front' is defined in this example by the edge provided to the feed mechanism). Such a profile can also be seen in figure 1. Figure 1 is a front elevation and it can be seen that the supporting surfaces of the arms and the central portion are all angled downwards towards the front, that is, in the feeding direction. The angle of the slope from back to front is 3° below the horizontal. As the stack depletes this has less influence because the variation in height of the stack diminishes.

[0046] Additionally the base terrain may be designed

to compensate for the uneven height of the stack. For example, for a C4 envelope, where the flap is along a long edge and the envelope is fed flap first, then the stack will be higher at the front (flap edge) and a profile that slopes downwards front to back will compensate for the uneven height of the stack. The amount of compensation is difficult to calculate but can be worked out by trial and error quite easily - whilst modelling any particular scenario might be useful in the end the real world dynamics of combinations of apparatus and media articles will require some trial and error to arrive at the best terrain profile. Since the stack requires less compensation as the stack depletes, it is counterproductive to fully compensate for the uneven height of a full stack. Thus the degree of compensation should work for stacks of all heights but will fall short of full compensation for a full stack e.g. 250 C4 envelopes. Thus the uppermost media articles may not present a perfectly flat leading edge profile but should be within the tolerances of the particular apparatus.

[0047] Figures 1 and 2 are a front and side view respectively of the jig components for retrofitting a feed tray. There are two main components, the cam piece 1 and the stock support member 2. The cam piece is an example of a cam member. In the present embodiment, the cam piece 1 and stock support member 2 are shown as being tethered by a retracting security cord 3. The purpose of the cord 3 is to ensure that the cam piece 1, which in use is fixedly attached to the back stop, is not left in the media drawer, when the support member 2 is removed. The cord 3 is optional; in the absence of the cord the user must remember to remove the fixings to extract the cam piece 1 when removing the support member 2. The support member 2 is merely placed on the tray floor inside the media drawer and is contained by the side wall and the back stop. The cord 3 forces the user to remove the cam piece when removing the support member. Alternatively, the design could be altered so that the cam piece 1 could be retained in the drawer permanently as would be the case for a non-retrofit solution.

[0048] The stock support member 2 includes base 4, a central stock support pillar 5, and pivot arms 6. Pillar 5 and arms 6 are examples of support surface members. Pillar 5 has a stock support surface 7. Similarly, pivot arms 6 have a stock support surface 8. Stock support surfaces 8 are located at the end of the arms of the jig of figure 1. It has been found, however, that the positioning and size (extent) of the support surfaces is dependent on the particular use. The required base terrain profile can be provided without a support surface constituting a significant portion of the desired profile. It is sufficient that the key points of the profile are provided with support surfaces for supporting the stock in use. In the present case the centre line of the stock and the end portions are the most important portions to be supported.

[0049] It has been found that the extended convex profile of the support surfaces 7 and 8, including a minimum width for support surface 7, prevents crease marks in the

lower most media items when a full stack is loaded in the tray.

[0050] As can be seen from figure 1, a portion of the support surfaces 8 is 'cut away' at the ends, this is to prevent interference with a air assist separation blowers. This is not necessary in a tray not including the air separation assist in the side fences.

[0051] The pivot arms 6 include side plates connected by a rod 9. The rod 9 is freely rotatably supported by posts 10 extending from the base 4. Thus the arms 6 are pivotally mounted on the base 4 by virtue of rods 9.

[0052] Mounted on the arms 6 are cam followers 11, conveniently located at the opposite end to the support surfaces 8. The followers 11 are fixedly attached to the ends of the arms 6 and protrude upwards to provide a cam surface 12 operating in conjunction with the cam piece 1 as described below.

[0053] Since figure 1 is a front elevation it can be seen that the profile presented by the support surfaces 7 and 8 is a convex surface that becomes slightly shallower from front to back (looking into figure 1). Put more simply, each of the surfaces 7 and 8 slopes towards the base from the rear to the front. The convex shape contributes to levelling out the sag in a large stack of media such as envelopes that sag in the middle. The slope down to the front deals with the uneven height of the stack from back to front where the flap of the envelopes is presented at the front of the stack. With these static design choices the number of envelopes that can be fed successfully from the media feed tray is substantially increased.

[0054] In order to ensure that a full stack of media such as envelopes can be fed, that is to ensure that all envelopes are presented correctly at the feed pick up point (generally horizontal or at least with a substantially straight or flat leading edge presented with an axis parallel to the longitudinal axis of the mouth of the feed mechanism) a dynamic profile is required for the base terrain. The dynamic profile is achieved by using the movement of the LCT floor relative to the backstop or lift guide to cause movement of the pivot arms 6 during depletion of the stack.

[0055] As can be more clearly seen on Figure 2, each cam follower 11 extends on an arm 11a rearward of a rear plate 6a of the arm 6. In figure 2 it can be seen that the retractable cord 3 is tied to the cam piece 1 and extends from a spool (not shown) within a spool housing 13. The jig can be so designed that the cam piece 1 can be stowed neatly on the support member 2, for example between the cam followers 11 and the side plates 6a. Cooperating magnets may hold the cam piece 1 in place on the support member when not in use. The spool housing is supported on an arm 14 extending from the rear of the central pillar 5. Since the cord 3 is optional, the arm 14 and spool housing 13 are also optional. The construction does prevent the cord 3 interfering with the movement of the arms 6 since the spool housing extends beyond the cam followers 11.

[0056] Figure 3 is a rear view of the jig in situ. The base

4 of the support member 2 sits on the tray floor 15. A part of the back stop 16 is also shown and it can be seen that the cam piece 1 is attached to an upper portion of the rear of the back stop 16. The rear of the base 4 may have a portion or portions (not shown) that engage the sides of the back stop posts providing stability and preventing sideways movement of the backstop that might interfere with the repeatability of the jig operation.

[0057] The cam piece 1 includes a two legs 17 depending from a cross piece 18. Ears 19 extend from the cross piece and include fixing holes 20 for receiving a fixing element such as a screw or bolt. Any convenient means can be used to affix the cam piece to the backstop 16. And of course the backstop could include the cam piece as an integral part. The ears 19 and fixing holes 20 are, therefore, optional. A connecting portion 21 is optionally provided in cross piece 18 for attaching the cord 3 to the cam piece 1.

[0058] An inner surface 22 of each leg 17 is a cam surface corresponding to the cam surface 12 of the corresponding cam follower 11. The specific arrangement of the cam piece is not essential and any means of providing the necessary cam surfaces would suffice. For example there may be multiple cam pieces providing the cam surfaces.

[0059] There is now described the action of the jig in operation, in particular with reference to figures 4A, 4B and 4C, but also figures 1 to 3 are useful, in particular figure 3.

[0060] A stack 100 is shown schematically in figure 4A. Stack 100 represents a plurality of media, for example a full stack of 250 C4 envelopes. Figure 4A is a rear view and the cam piece 1, tray 15 and backstop 16 are not shown for reasons of clarity. The stack 100 rests on the support member 2 which provides a new base terrain in place of the flat base terrain of the feed tray in which the support member 2 sits. As can be seen, whilst the lower portion of the stack tends to more or less conform to the curved convex profile of the support surfaces 7 and 8, the upper portions of the stack, in particular the top of the stack presented to the pick up roller is horizontal.

[0061] Of course the rear view of figure 4A does not illustrate that the stack 100 is thinner at the rear than it is at the front since the envelope flaps are orientated to the front of the tray. The slope of the support surfaces from front to back deals with this issue as mentioned above in relation to figure 1.

[0062] Starting from the position in figure 4A, the stack 100 rises under control of the apparatus; each time an envelope is fed from the top of the stack the tray floor is raised incrementally, and the support member 2 and stack 100 rise with the tray floor.

[0063] In fact a significant proportion of the stack can be safely fed from the feed tray in the present example without any further action required. However, as the stack 100 becomes depleted, the curved profile of the support surfaces 7 and 8 is no longer necessary and in fact over compensates for the depleted stack. If the base terrain

profile remained static the lower portion of the stack 100 could not be fed correctly because the top envelopes would be slightly curved to follow the profile of the support surfaces 7 and 8.

[0064] In order to deal with this issue the jig of the present embodiment uses a dynamic profile for the final portion of the stack. As the support member is raised and the stack is depleted, before the edge of the top envelopes becomes too distorted to be correctly fed, the cam surfaces 12 of the followers 11 abut the cam surfaces 22 of the legs 17 of the cam piece 1. The angle that the cam surfaces 12 and 22 present to each other determines how much further movement the cam followers can make relative to the cam piece; it is a matter of trial and error and the design depends on the feeding dynamics of the particular use (stock, apparatus etc.).

[0065] Once the cam surfaces 12, 22 are in abutment, the upward motion of the cam followers 11 is restrained and the ends of the arms 6 carrying the cam followers is forced downwards relative to the base 4 of the support member 2. Consequently, the ends of the arms 6 carrying the support surfaces 8 are forced upwards relative to the base 4 as the arms pivot around rods 9.

[0066] Figure 4B shows an intermediate point where the arms 6 have started to lift and raised the outside edges of the depleted stack 100a so that the top envelopes continue to be presented correctly (i.e. with a substantially straight edge) to the feed mechanism (not shown).

[0067] In figure 4C the cam followers have been pushed further down by the action of the cam surfaces 12 and 22 by virtue of the rising feed tray relative to the back stop 16 to which the cam piece 1 is attached. The outer portions of the arms 6 are therefore further raised. In fact in figure 4C the arms are raised to their fullest extent and the support surfaces 7 and 8 present a substantially straight line for any particular section taken between the front and rear of the support member 2. The support surfaces will still slope downwards towards the front slightly. The cross section of the terrain profile is a substantially straight line. The further depleted stack does no longer require a curved base terrain to deal with any sag in the stack since there are too few envelopes in the stack to cause any sag. Whilst the base terrain profile is now substantially flat it is not horizontal since the surfaces 7 and 8 still slope downwards back to front to deal with the issue of the greater thickness of the envelopes at the front where the envelope flap is. Whilst the variation in the height of the stack because of the flap thickness may not be an issue when there are a small number of envelopes in the stack, the fact is that compensating for the variation in height does not affect the ability of the envelopes to be safely fed when there is no great variation in height to be compensated for. In other words the slope of the support surfaces from the rear to the front has more of an effect the greater the height variation in the stack, i.e. when there are more articles in the stack.

[0068] Media feeders commonly comprise various

sensors in the tray drawer to determine whether or not stock is loaded in the media tray. When the media tray is empty the tray floor automatically descends to the bottom of the media drawer. The sensors also control the rate at which the media tray is raised by sensing how far from the sensor the top of the media stack is. In order for the sensors to operate correctly, the base 4 of the support member may have openings at locations corresponding to the location of the sensor devices in the tray floor.

EXAMPLE

[0069] An example of a retrofit insert suitable for use with an LCT manufactured by Ricoh is shown in Figures 5 and 6. The Ricoh LCT for which the example has been designed is presently sold under the model names RT5010, RT5040, RT5020 and RT5050.

[0070] Figure 5 shows the dimensions and exemplary radii for curved portions of the design of the cam piece 1. Of course even for the specific example other configurations may also be suitable and simple trial and error would allow different configurations to be designed. The curved portions are not shown as curved in the figure but would be manufactured as curved.

[0071] Figures 6 and 7 are a rear and side view of the jig in position in an LCT and indicates various dimensions. All dimensions are given in millimetres and angles in degrees radius. The reference in figure 7 to 3° is the angle that the support surface of the central pillar makes with the horizontal.

[0072] The base 4 has overall dimensions of 325mm by 230mm, not including any portions that might extend beyond the plane defined by the backstop.

[0073] The invention has been described by way of example only with reference to the accompanying drawings. Various modifications will suggest themselves to the skilled person without departing from the scope of the invention as defined by the appended claims.

[0074] In particular, the described embodiment relates to a retrofit device but a feed mechanism could be produced from scratch including a modified base terrain in accordance with the principles of the invention. Instead of the jig base the necessary members could be mounted on the tray floor. Further more at least the cam surfaces could be permanently arranged in the media feed tray. For a non-retrofit solution the floor of the media tray could provide two modes; one in which the base terrain is always flat and one which provides a modified and dynamic base terrain in accordance with the present invention. For example, in the described embodiment, the cam piece 1 could be mounted so as to be moveable from a first fixed position to a lower position where the arms 6 of the support member are raised even when the floor of the input tray is at its lowest position so as to prevent a substantially flat base terrain profile. The cam piece 1 would then move with the floor of the input tray as it travelled vertically during a feed operation thereby maintaining the arms in a fixed position but allowing upward move-

ment of the support member and tray floor. A substantially flat base terrain profile could thereby be maintained for feeding flat media. This solution could also be provided in a retrofit solution with a modified cam piece.

[0075] In the described embodiment the cam piece has been described as detachably fixed to the rear of the back stop external to the tray interior. This is not necessary and the cam piece could be arranged extending into the interior of the tray, for example affixed to the internal surfaces of the back stop. The relative positions of the cam followers would need to be changed but this is not complicated. The followers would then be mounted so as not to extend so far from the side plate 6a.

[0076] The embodiment relates to a solution for a particular form of folded media article, that is an envelope with a flap along a long edge that is fed flap first, in particular a C4 standard envelope. Various modifications might be made for different folded media, such as different styles of envelopes, folders, sheets having a label or card affixed thereto (e.g. DocuCards), PIN labels etc. The support member could have different numbers of moveable arms which could be positioned in different orientations. For instance the arms could be located at the front and back rather than the sides, with a static profile presented by a central portions extending side to side. There might be a single moveable arm at the front or back or one side depending on the media stock to be fed and the configuration of the feed tray.

Claims

1. Apparatus for supporting a media stack in a media feeding device comprising:
 - a cam member (1) providing at least one cam surface (22);
 - a support member (2) including a base (4) and a plurality of support surface members (5, 6) mounted on the base (4), each support surface member (5, 6) providing at least one support surface (7, 8), the support surfaces (7, 8) in combination providing a base terrain profile for supporting a stack of media to be fed by a pick up mechanism, at least one of the support surface members (5, 6) being a pivot able arm (6), and at least one of the support surface members (5) being fixed relative to the base (4);
 - wherein at least one pivot able arm member (6) carries a cam follower (11), and the base terrain profile provided by the support surfaces (7, 8) is variable by virtue of said cam follower (11) cooperating with a corresponding cam surface (22) of the cam member (1) during a media feed operation.
2. Apparatus according to claim 1, wherein the at least one fixed surface support member is centrally located

ed so as to provide a raised central base terrain profile.

3. Apparatus as claimed in claim 1 or 2, wherein the support surface members include two pivot able arm members and an intermediate fixed support surface member.
4. Apparatus as claimed in claim 3, wherein the pivot able arm members are independent each carrying a cam follower cooperating with a respective cam surface.
5. Apparatus as claimed in claim 3, wherein two or more pivot able arm members are connected and there is a single cam follower and a single corresponding cam surface for the connected pivot able arm member.
6. Apparatus as claimed in any one preceding claim, wherein at least one support surface describes a decreasing height above the base along a longitudinal axis thereof.
7. Apparatus as claimed in claim 6, wherein a plurality of support surfaces extend longitudinally along parallel axes and each of said surfaces are at an angle to the base.
8. Apparatus as claimed in claim 6, wherein the angle to the base is between 2 and 4 degrees, optionally approximately 3 degrees.
9. Apparatus as claimed in any one preceding claim, wherein the base member is the floor of a media input feed tray.
10. Apparatus as claimed in any one of claims 1 to 8, wherein the base member is an insert for media input tray, which can be removed when not required.
11. Apparatus as claimed in claim 10, wherein the cam member is removably mountable in the input feed tray of a media feeding device and the cam member is tethered to the support member.
12. Apparatus as claimed in any one preceding claim, wherein the base terrain profile provided by the support surfaces is configured to compensate for variations in stack height caused by the a media stack having media with localised thickness variation.
13. Apparatus as claimed in claim 12, wherein the cam member and support member are arranged such that an initial base terrain profile provided by the support surfaces is static for a predetermined depletion of the media stack and the cam surface of the cam member operates on the cam follower of the pivot

able arm so as to decrease the amount of compensation provided for variations in stack height caused by localised thickness variation of the media as the stack depletes beyond the predetermined level.

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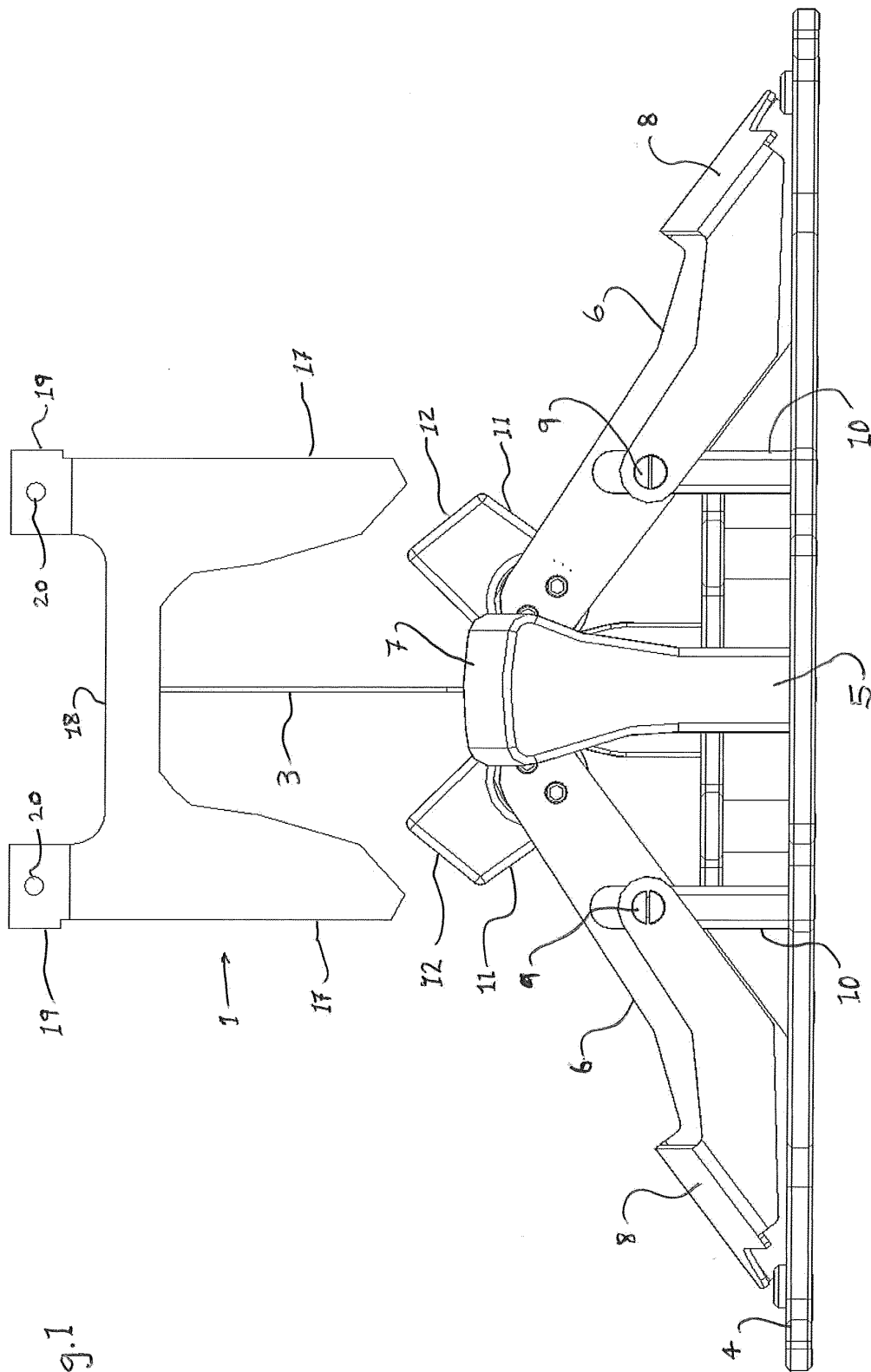
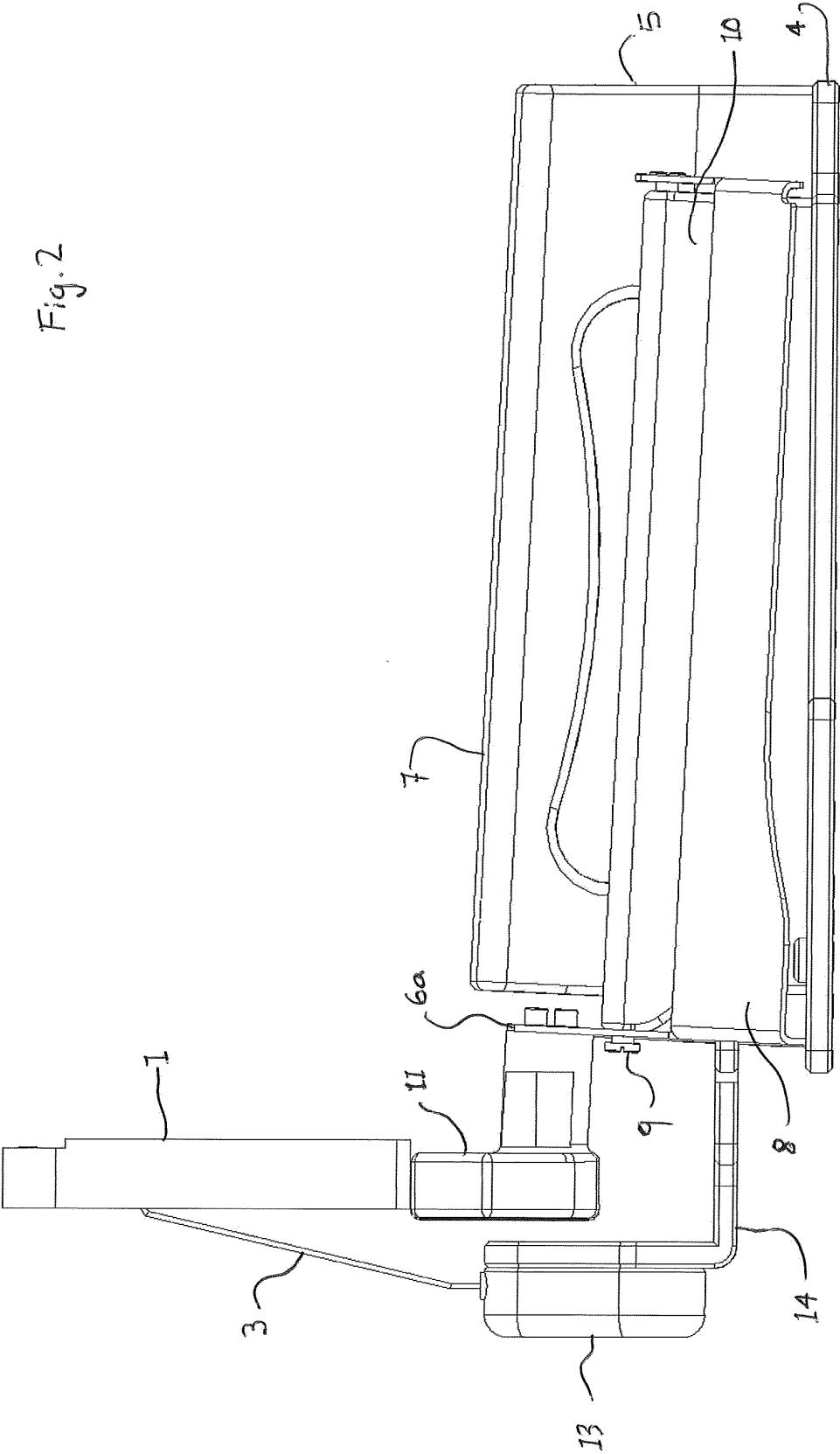


Fig.1

Fig. 2



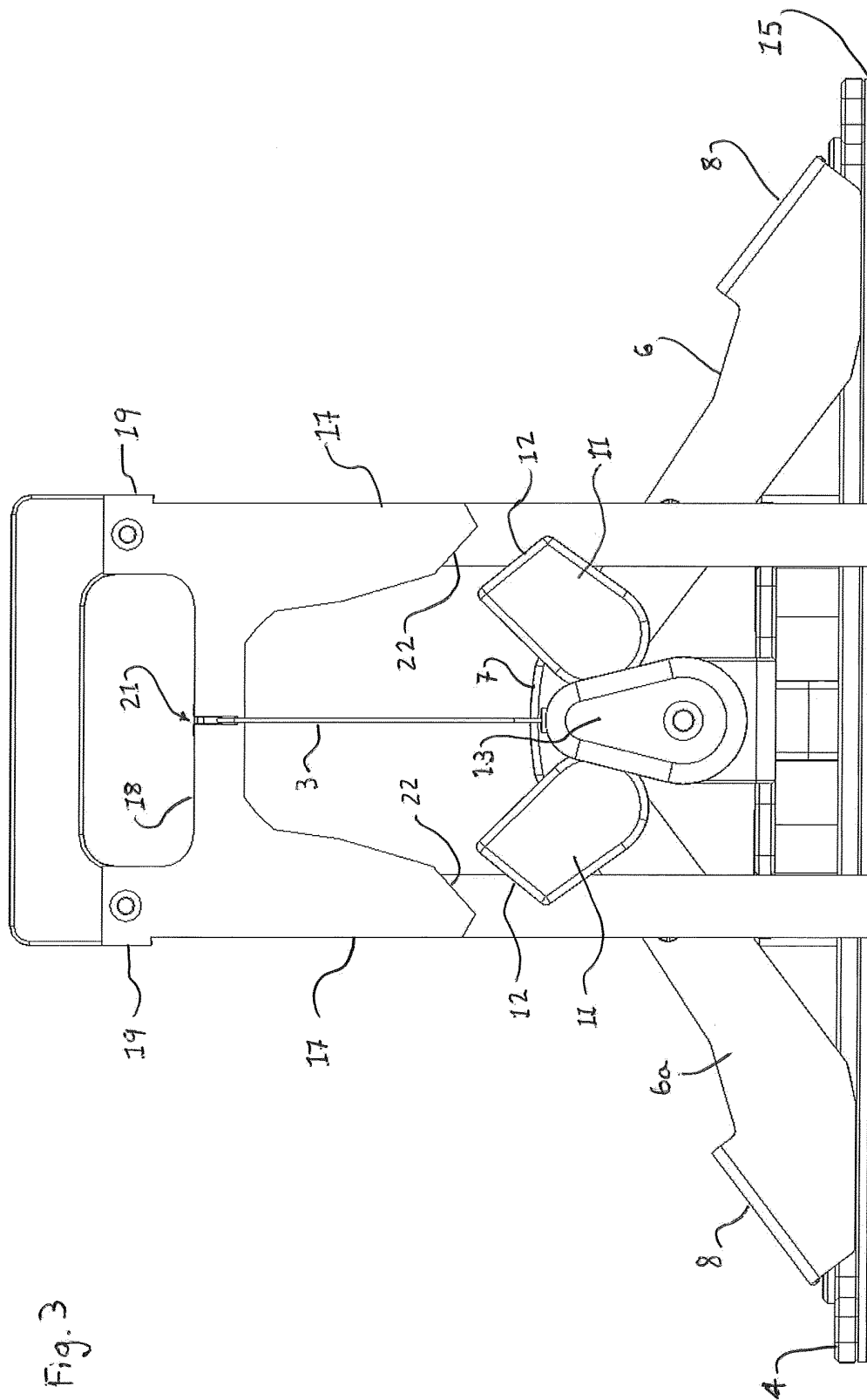


Fig. 3

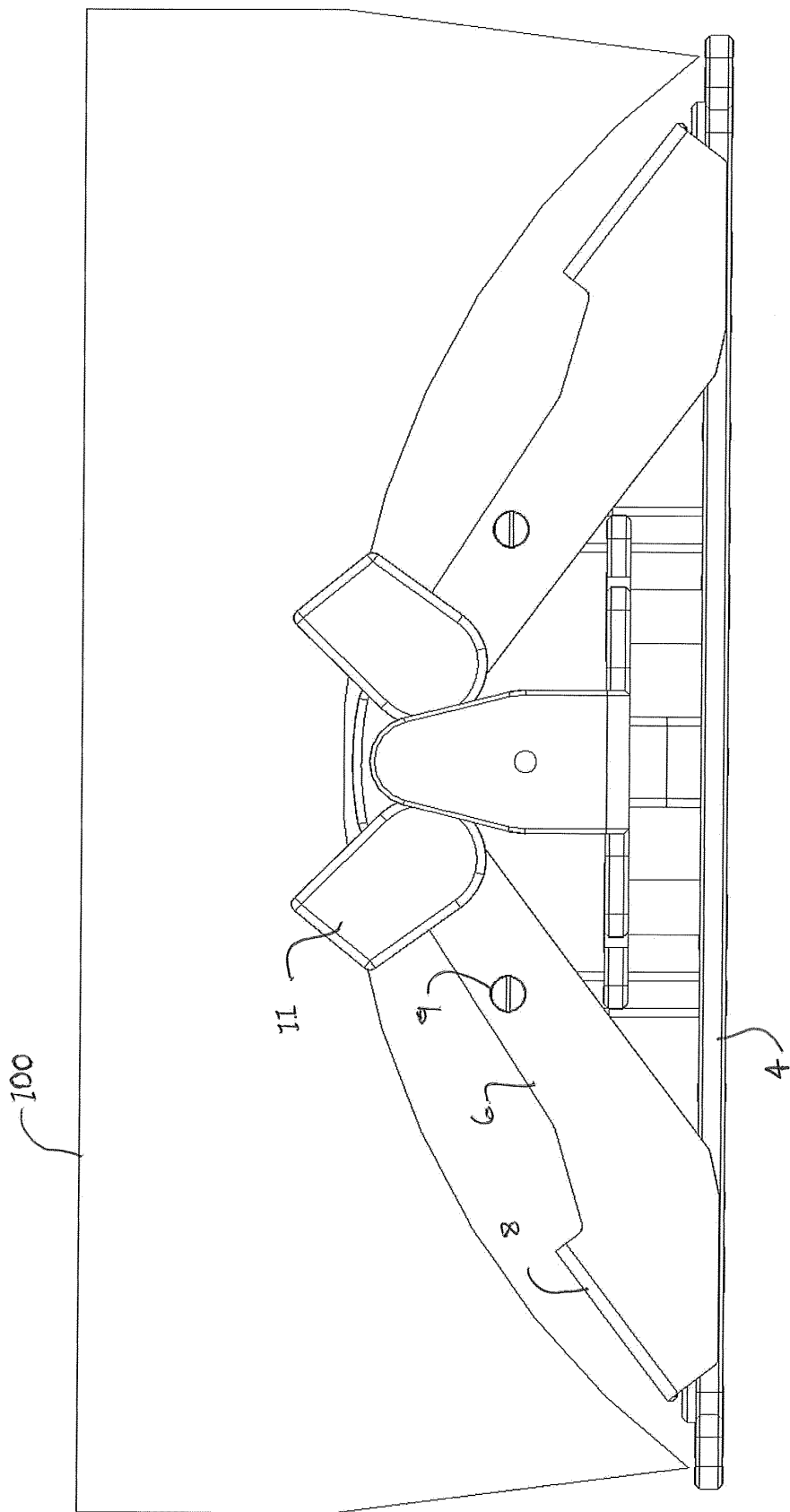


Fig. 4A

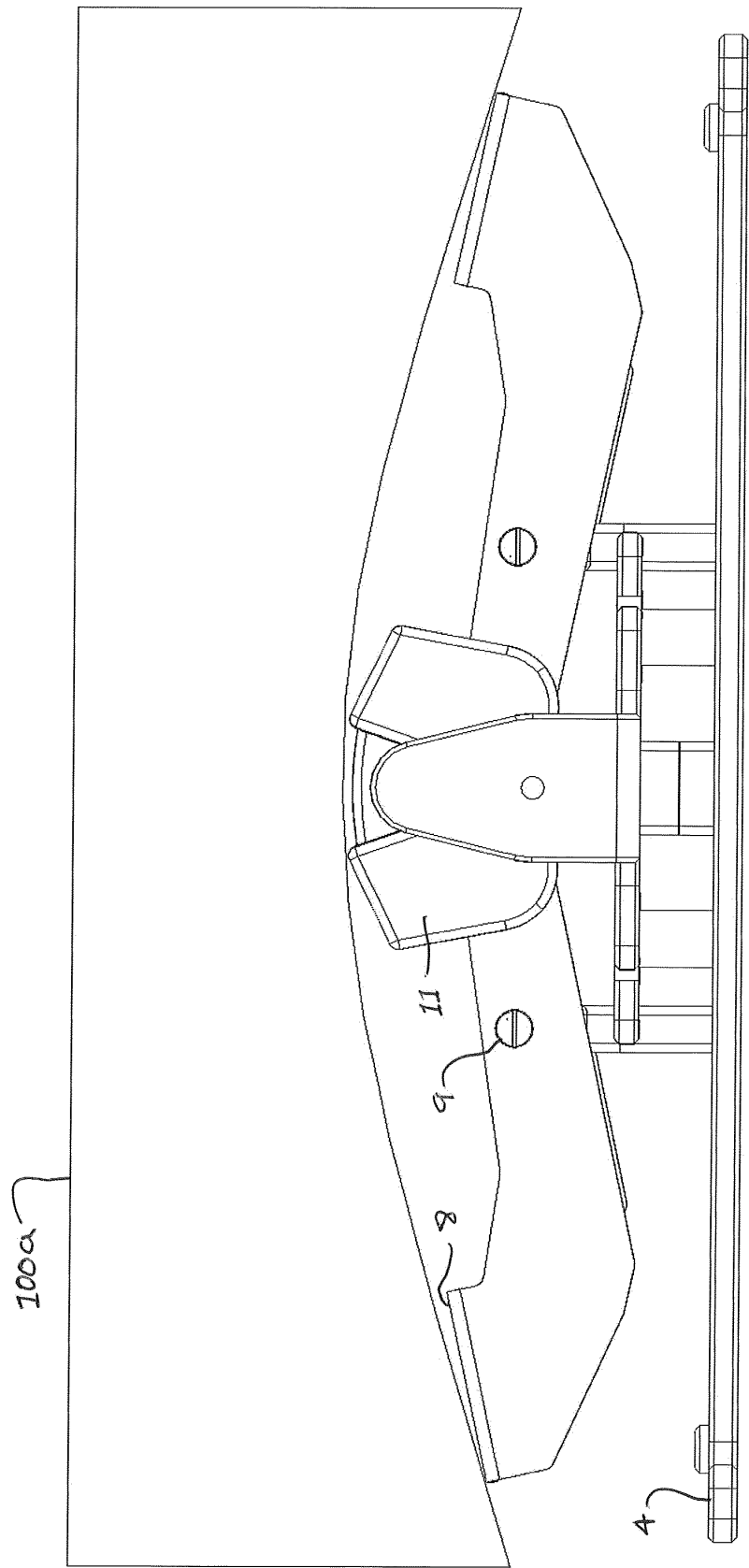


Fig. 4B

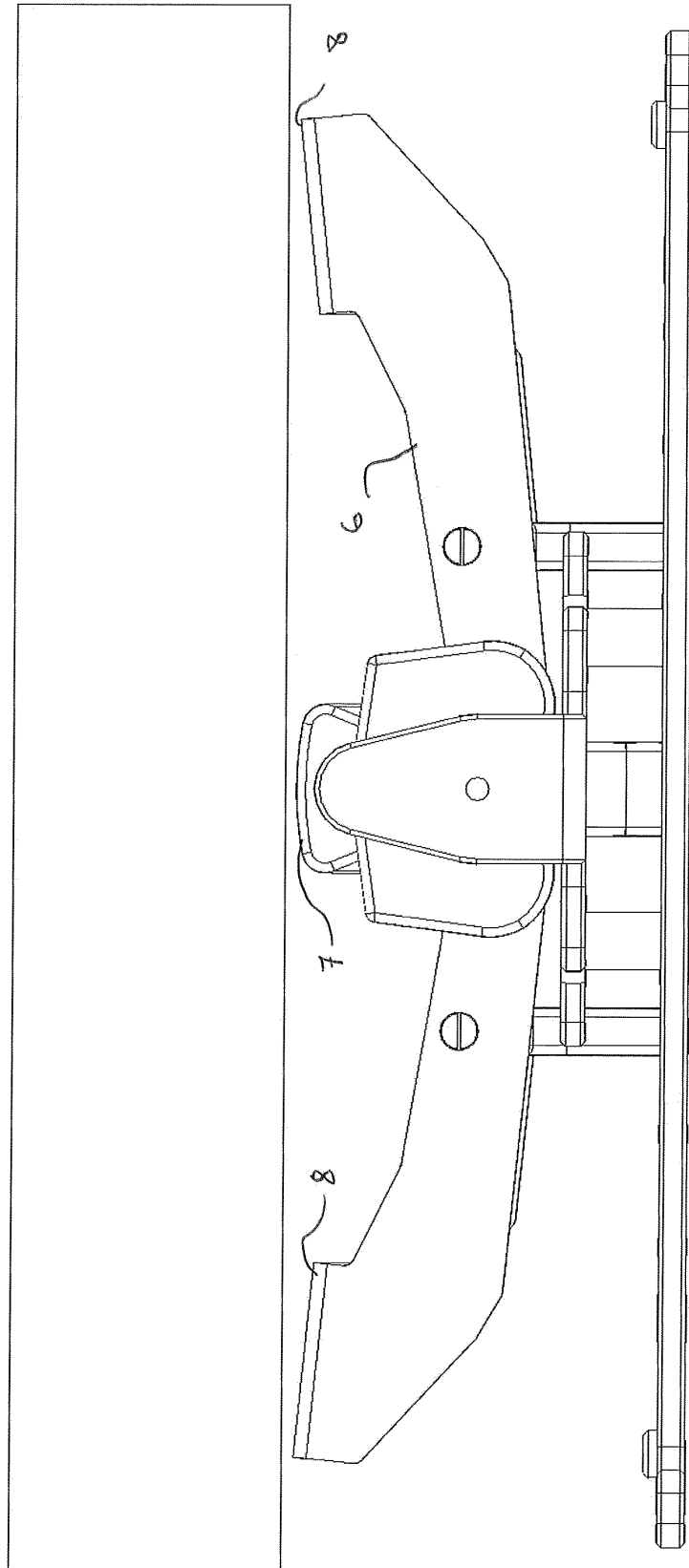


Fig. 4C

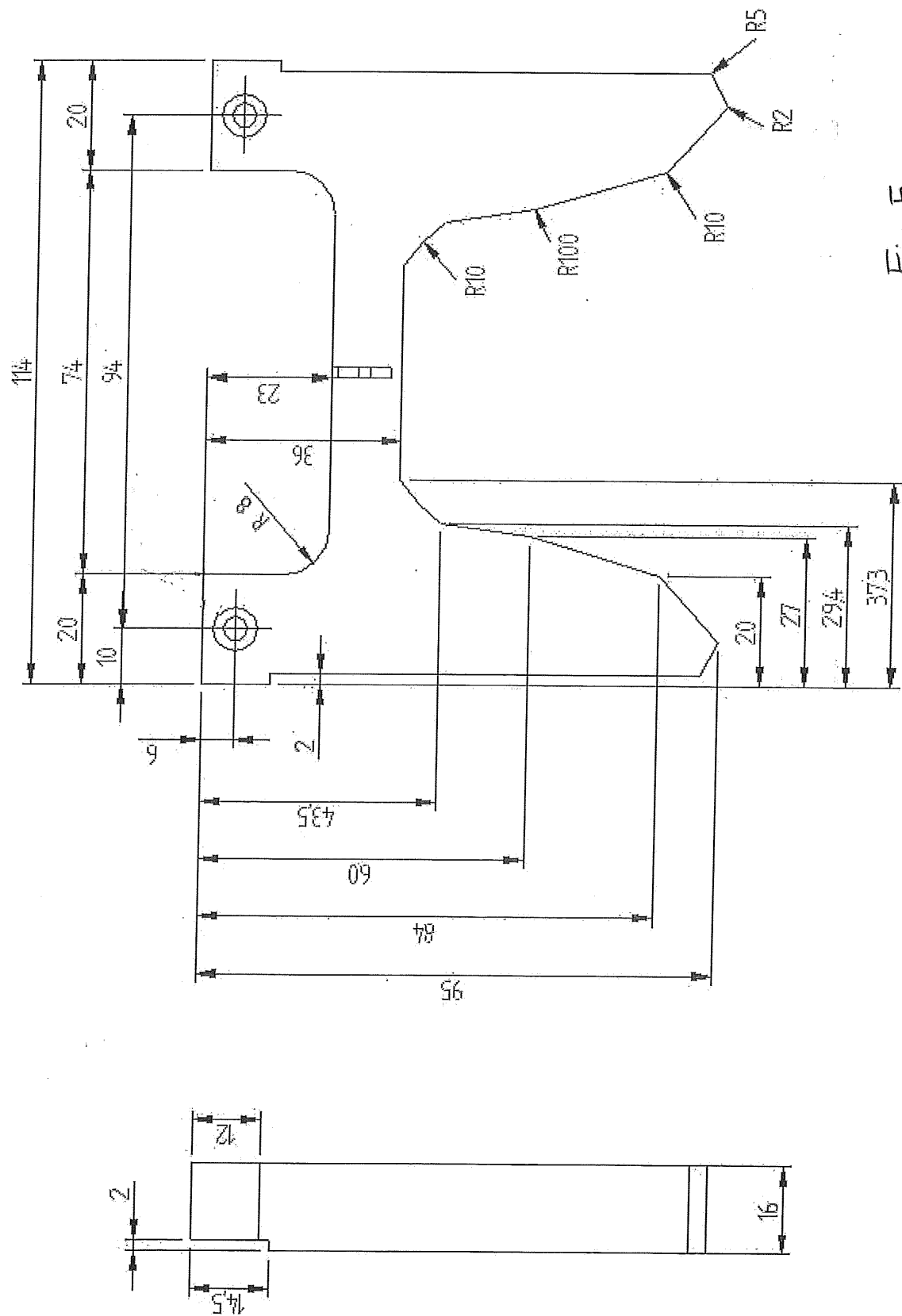


Fig. 5

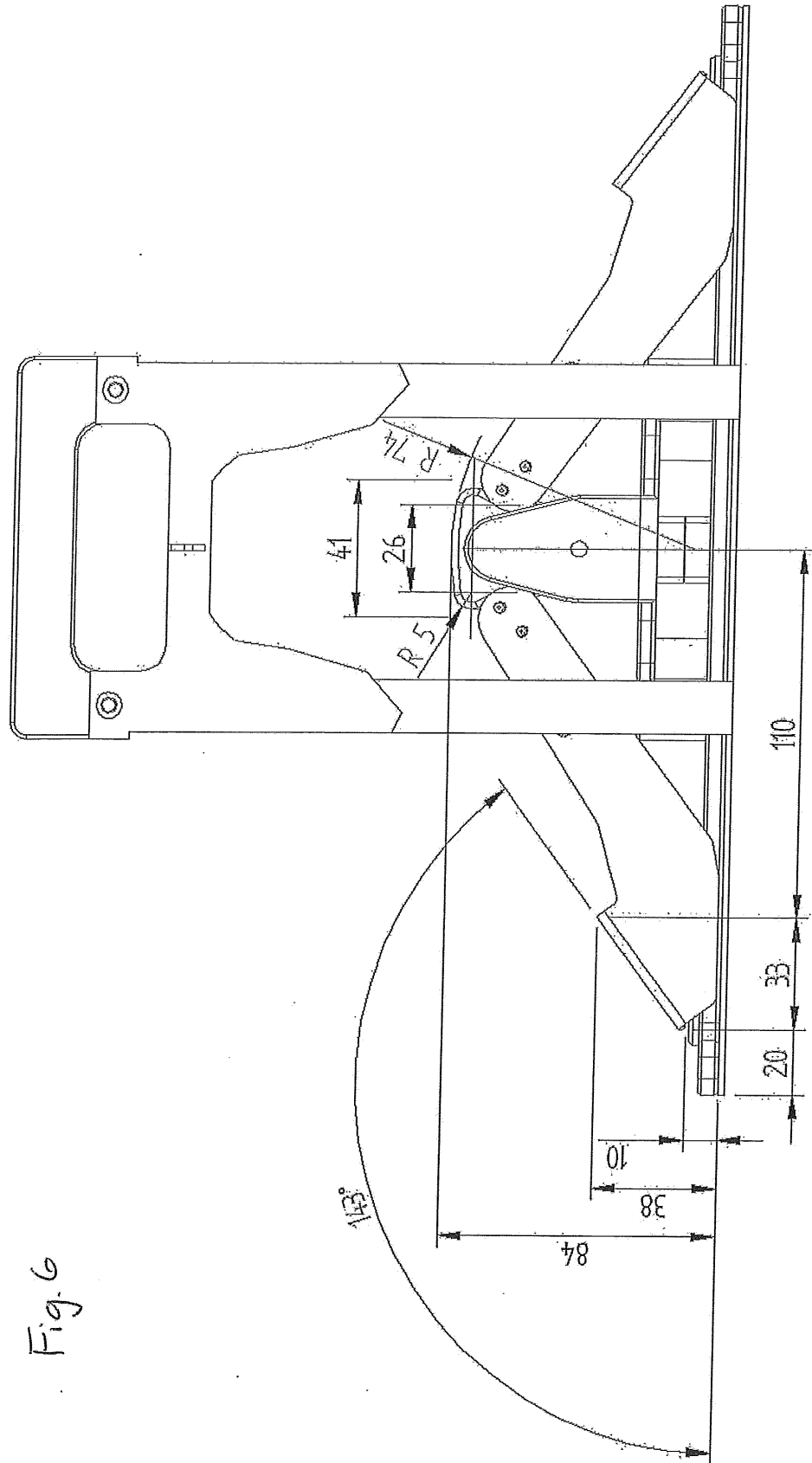
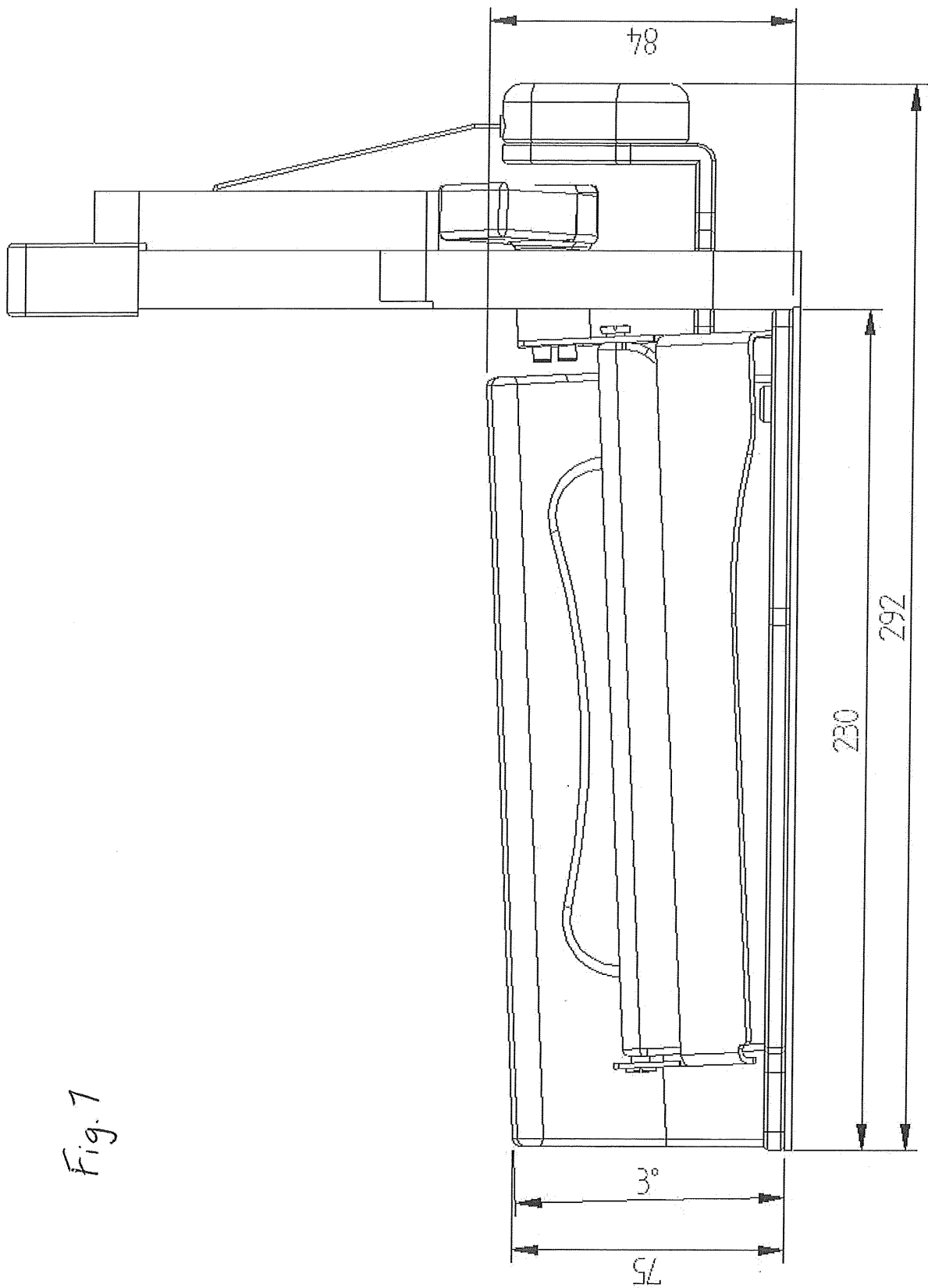


Fig. 6





EUROPEAN SEARCH REPORT

 Application Number
 EP 13 15 5918

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A,D	US 2007/257419 A1 (WILCOX RAYMOND D [US] ET AL) 8 November 2007 (2007-11-08) * paragraph [0032] - paragraph [0040]; figures 1-14 *	1-13	
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A	US 5 302 080 A (SMITH DAVID A [US] ET AL) 12 April 1994 (1994-04-12) * column 5, line 45 - column 8, line 37; figures 1-8 *	1-13	
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			B65H
Place of search		Date of completion of the search	Examiner
The Hague		12 July 2013	Henningsen, Ole
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 13 15 5918

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12-07-2013

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