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Tilted Printing Surface

Abstract

A tilting printing surface formed on a print plate is provided for use in combination with a 3D printer. The printing plate, having a printing surface thereon for forming a printed component with a print head of the 3D printer, is rotatable from a horizontal position to a substantially vertical position. A powered drive may be coupled to the printing plate or a carriage therefor to rotate the print plate from a horizontal position wherein printing may occur thereon to the substantially vertical position wherein gravity will pull upon a printed component to dismount it from the print surface.

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Background/Summary

FIELD OF THE INVENTION

[0001] This application claims priority to U.S. Provisional Patent Application Ser. No. 63/554,928 filed on Feb. 16, 2024.

[0002] The disclosed device relates to 3D printing. More particularly, it relates to a printing surface for 3D printing which rotates to tilt the printing surface to enhance the removal process of the printed component from the printing surface.

BACKGROUND OF THE INVENTION

[0003] The history of 3D printing dates back to the 1980s when it emerged as a revolutionary technology in manufacturing and design. The first 3D printer, capable of building three-dimensional components in a layer by layer formation from a liquid resin, was patented in 1986. In the early years, 3D printing was mainly used for prototyping, allowing engineers and designers to create models and test them without the need for expensive molds or time-consuming production methods.

[0004] However, as the technology evolved through the 1990s and 2000s, several different methods of 3D printing were developed, such as selective laser sintering (SLS) and fused deposition modeling (FDM). These and other innovations have expanded the potential applications of 3D printing into industries like aerospace, automotive, and healthcare.

[0005] More recently, the technology has begun to gain attention outside of purely industrial sectors as advancements in desktop 3D printers have made the technology more accessible to hobbyists and small businesses. Today, 3D printing is used in a wide range of fields from creating custom prosthetics and architectural models to producing food and even building houses. Its versatility and ability to create complex, customized objects continue to push the boundaries of manufacturing and design.

[0006] In virtually all modes of 3D printing, material forming a part or component is deposited upon a printing surface. Once the printer is finished forming the component thereon, it must be removed. This removal process is often a tedious and time-consuming task, requiring manual effort to dislodge the part from the print surface. Operators frequently use tools, such as scrapers or chisels, carefully working to avoid damaging the part or the machine. For high-throughput printing, the repetitive nature of this process can significantly slow down workflow, introduce inconsistencies, and increase labor costs making part removal a major bottleneck in production.

[0007] In this respect, before explaining at least one embodiment of the tilting printing surface system herein in detail, it is to be understood that the tilting surface and operation thereof is not limited in its application to the details of construction and to the arrangement of the components set forth in the following description or illustrated in the drawings nor the steps outlined in the specification.

[0008] Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting in any manner. As such, those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for designing other methods and systems for carrying out the several purposes for the tilting printing surface system for a 3D printer disclosed herein. It is important, therefore, that the claims be regarded as including such equivalent construction insofar as they do not depart from the spirit and scope of the present invention.

OBJECTS OF THE INVENTION

[0009] An object of this invention is the provision of a print surface on a print plate for operative positioning with a 3D printer which is configured to translate and rotate and thereby employ gravity to urge printed components from the printing surface.

[0010] An additional object of this invention is the provision of such a print plate with a rotating print surface, which additionally includes a means to urge the component to detach from the printing surface.
[0011] A further object of this invention is the provision of such a rotating printing surface on a printing plate employed with a 3D printer, which includes a kinematic coupling to ensure the repeatable positioning of the printing surface to a precise position for forming a printed component thereon.
[0012] These, together with other objects and advantages of the disclosed tilting printing surface and system herein, which will become subsequently apparent to those skilled in the art, reside in the details of the device construction and method herein as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part thereof, wherein like numerals refer to like parts throughout.

SUMMARY OF THE INVENTION

[0013] The pivoting printing surface system herein provides a tilting print plate having a printing surface on an upper side which is employable in combination with a conventional 3D printer. The print surface on the print plate is pivotally engaged to translate and rotate between a horizontal “as used” positioning, wherein one or a plurality of print heads form a printed component thereon, and a vertical positioning wherein the component is urged to detach automatically and exit the printer housing to a collection container. By vertical positioning herein is meant that the print surface on the print plate is located on an axis running substantially perpendicular to a horizontal axis of the printing surface located in the as-used or printing position. By substantially perpendicular is meant the printing surface in the vertical positioning is at a right angle plus or minus thirty degrees to the print surface in the horizontal positioning whereby gravity will aid in the detachment of a printed part from the print surface.
[0014] A primary innovation in the printing surface for a 3D printer herein is the powered pivoting movement of the print plate and print surface thereon, from this horizontal position to the vertical positioning and back to a precise positioning of the print plate and print surface in the horizontal positioning. This precise tilting and positioning may be provided by a powered drive, such as a kinematic coupling of the print plate having the printing surface to the OEM actuators employed to move the print surface relative to the printer and one or more print heads. These conventional actuators may be used to provide the powered drive for powered movement to translate and rotate the carriage and the print plate and printing surface coupled thereto to a vertical positioning and thereafter, to level and orient the print surface in a precise repeatable horizontal printing position or “as used” positioning relative to the motion of one or more printing heads. The printer actuators may be operatively connected to a linear drive mechanism to thereby move the carriage and print surface between the horizontal and vertical positioning. Alternatively, the controlled powered movement of the carriage holding the print surface and coupled with a mount can be provided by a powered drive and may be one such as an electric motor, and the like, engaged with a linear drive such as a worm gear, belt, ribbon, or similar powered linear drive mechanism. As such, by powered drive herein is meant any electric powered drive mechanism which is configured for engagement to the printer plate or carriage to rotate the printer plate between the horizontal position and the vertical position.
[0015] The actuators, be they separate powered drives or those included in the 3D printer itself supporting the printing surface on the print plate, may provide for the translation and pivoting or rotation of the print plate and printing surface using a coupling of a support carriage to a linear drive or track providing precise linear movement to the coupled carriage. Currently, this linear drive providing such movement is in a vertical translation. However, it should be noted it could also be in a horizontal movement and push the printing surface to the vertical positioning. By linear drive herein is meant a component configured to provide precise powered linear movement to a mount, to which the carriage is coupled and thereby translate the carriage coupled with the print

surface by using a powered drive, such as a stepper motor, a linear electric motor, a rotating geared connection powered by an electric motor, a belt/pulley connection, or screw drives, such as powered worm gears or other highly accurate means for powered translation and accurate positioning of the mount thereon, to which the carriage supporting the print surface is engaged. The linear drive may be engaged with either a support wall, included as a part of the system herein, or can be connected with the housing of the 3D printer in which the system herein is configured for positioning to provide such a support wall.

[0016] Printing surfaces herein, in one mode, achieve this highly accurate and repeatable registered positioning of the printing surface to the as-used horizontal positioning through the employment of kinematic couplings which provide for precise positioning of the print plate and printing surface thereon, relative to the printing device and print head or nozzle positioned there above. By kinematic coupling herein is meant that the print plate, having the printing surface thereon and the connections thereto providing the horizontal and vertical movement thereof, are configured to constrain the printer plate and printing surface to a known or registered position, each time it returns to the horizontal printing position, thereby providing precision and certainty of the printing surface location during the 3D printing process.

[0017] In operation, the moving carriage communicates a sliding action to position the printer plate and printer surface positioned thereon from the precise horizontal positioning, employed for printing, to a substantially vertical positioning so as to orient the printing surface to employ gravity as a removal aid. The pivoting or tilting print plate and print surface system thereon may include one or more kinematic interfaces which easily decouple and subsequently reseat either on the supports for the print plate or in locations between the print plate and a supported position adjacent or below it. Such kinematic interfaces allow for the gravity-assisted printed component removal process herein, while still protecting the return to the precise registered positioning of the print surface.

[0018] Still further, the system herein, without undue mechanical complexity, implements a kinematic positioning apparatus that is capable of decoupling or repositioning for pivoting or rotation and a part detachment and removal and a subsequent repositioning or re-coupling for printing and precise adjustment. This highly accurate or registered positioning is accomplished while concurrently maintaining the rigidity necessary for robust and high quality 3D printing. As such, the printing plate with the printing surface thereon and the carriage and supports for the printing plate are easily employed for operative positioning and use in combination with existing 3D printers either by retrofit or as included in an OEM product.

[0019] Finally, the system herein can include additional printed part detachment components and functions, which may be communicated to the printing surface upon reaching a substantially vertical positioning. Such detachment components may include one or a combination of part detachment components from a group including a vibration component, such as a vibration motor or haptic actuator to communicate vibration to the printing surface, a Peltier thermoelectric cooling chip which may communicate heat or cold to the printing surface, or a conduit having cold air supply exiting therefrom directed to contact the printing surface.

[0020] With respect to the above description then, it is to be, realized that the dimensional relationships and components of the device and method herein may also include variations in size, materials, shape, form, function and manner of operation, manner of formation, assembly, and use, which are deemed readily apparent and obvious to one skilled in the art subsequent to their review of this specification. Therefore, the foregoing summary and following description should be considered as illustrative only of the principles of the tilting printing surface system for a 3D printing surface invention to provide an easily employable aid in removal of printed components therefrom.

[0021] Further, since numerous modifications and changes will readily occur to those skilled in the art, subsequent to their review of this disclosure, it is not desired to limit the invention to the exact

construction and operation and steps of formation and employment of the rotating print surface for a 3D printing surface, as shown and described. Accordingly, all suitable modifications and structural and functional equivalents, which may be resorted to, are considered to fall within the scope of the invention.
[0022] Further, since numerous modifications and changes will readily occur to those skilled in the art, subsequent to their review of this disclosure, it is not desired to limit the invention to the exact construction and operation and steps of formation and employment of the tilting printing surface system, shown and described. Accordingly, all suitable modifications and structural and functional equivalents, which may be resorted to, are considered to fall within the scope of the invention.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0023] The accompanying drawings, which are incorporated herein and form a part of the specification, illustrate some but not the only or exclusive examples of embodiments of the tilting printing surface system herein providing both functional and appearance renewal. It is intended that the embodiments and figures disclosed herein are to be considered illustrative of preferred embodiments of the tilting and translating printing surface device and system rather than limiting.
[0024] The accompanying drawings, which are incorporated herein and form a part of the specification, illustrate some but not the only or exclusive examples of embodiments of the tilting printing surface system and assembly for a 3D printing surface herein. It is intended that the embodiments and figures disclosed herein are to be considered illustrative of preferred embodiments of the pivoting or tilting printing surface device and system, rather than limiting.
[0025] FIG. **1** depicts the tilting printing surface system herein operatively engaged to work in combination with a conventional 3D printer, showing the printing surface located on the printing plate coupled to a carriage with the printing surface in a horizontal “as used” positioning on which a 3D printer forms a printed component thereon.
[0026] FIG. **2** shows the tilting printing surface system of FIG. **1**, wherein the printing surface on the surface of the printing plate has been repositioned to a substantially vertical positioning by translation of the carriage whereby gravity aids in the detachment of the printed component.
[0027] FIG. **3** is provided as a depiction of the prior art of conventional 3D printers wherein the system herein with the printing plate and printing surface thereon is operatively positioned with the printer in a manner to maintain it while in the horizontal as used position.
[0028] FIG. **4** shows the tilting printing surface system, as in FIG. **1**.
[0029] FIG. **5** depicts the printing plate and printing surface thereon in a pivoting or rotating engagement with a track drive, such as with a translating mount which translates in a linear motion under power from a linear electric motor or an electric motor operatively coupled with a powered belt, rail, or a screw drive, or the like.
[0030] FIG. **6** depicts the movement of the printing surface to a substantially vertical positioning.
[0031] FIG. **7** shows the tilting printing surface system, as in FIG. **6**, wherein the printing plate and printing surface thereon have been elevated.
[0032] FIG. **8** shows the detachment of the printed component from the vertically positioned printing surface of FIG. **7**.
[0033] FIG. **9** shows the printed component exiting the printer housing through an exit opening directly below the vertically positioned printing surface of FIG. **8**.
[0034] FIG. **10** depicts the tilting printing surface system, as in FIG. **4**, wherein the printing surface is in a kinematic coupling with the carriage imparting movement thereto, to provide a certainty of location in the “as used” position of FIGS. **4** and **1**, during printing thereon.
[0035] FIG. **11** shows the decoupled kinematic printing surface moving from the horizontal

position of FIG. **10** toward the positioning of FIG. **12**.
[0036] FIG. **12** shows the decoupled kinematic printing surface rotated in its engagement to a moving carriage to a vertical positioning.
[0037] FIG. **13** shows the printing surface, as in FIG. **12**, wherein the printed component thereon is pulled by gravity to start dismounting.
[0038] FIG. **14** depicts the printing surface, as in FIG. **13**, wherein the printed component has dismounted therefrom.
[0039] FIG. **15** shows the exit of the printed component from the housing of the printer through an opening aligned with the printing surface located there above.
[0040] FIG. **16** depicts some optional detachment aids which may be included with the system herein to further aid detachment of the printed component from the printing surface.
DETAILED DESCRIPTION OF THE INVENTION
[0041] Referring now to the drawings in FIGS. **1-16**, there are shown similar components of the tilting printing surface system **10** are identified by like reference numerals. As noted, FIG. **1** depicts the tilting printing surface **12** system **10** herein, operatively engaged to function in combination with a conventional 3D printer, such as shown in FIG. **3**. As shown, a printing surface **12** is located on the printing plate **14** in a horizontal “as used” positioning on which the 3D printer **1**,**1** used in combination herewith, forms a printed component **16** thereon.
[0042] In FIG. **2** is depicted a pivoting or tilting of the printing surface system **10** of FIG. **1**, wherein the printing surface **12** on one side of the printing plate **14** is coupled to a powered drive to move between the horizontal position and the vertical position. Such a coupling may be, as shown, to a carriage **18**, which moves to the substantially vertical positioning whereby the force of gravity will aid in the detachment of the printed component **16**. The coupling of the printer plate **14** to the carriage **18** may be with a support member **17** or a similar means for holding the support plate **14** securely to the carriage **18**.
[0043] The carriage **18** is in pivoting coupling **19**, such as a mount **24**, for the depicted linear drive **22** such that the carriage **18** and the first end of the print plate **14** will pivot in that coupling as it moves from the horizontal positioning of FIG. **1** to the substantially vertical positioning of FIG. **2**. While shown with two powered or linear drives **22** on opposing sides of the carriage **18**, coupled either with the 3D printer actuators **15** or a powered drive **13**, the system **10** may be configured with at least one powered or linear drive **22** coupled with a moving mount **24** sliding upon a track or race **25** (FIG. **10**) or other support for the opposite side of the carriage **18**. Additionally, as noted, the force for moving the printing surface **12** between the horizontal position and the vertical position may also be provided by the conventional actuators **15** already on or used by such 3D printers to move the print head **20** and other components thereof. As such, the powered drive **13** may be the printer actuators **15** since they are already computer controlled to provide powered movement.
[0044] The drawing of FIG. **3** is provided as a prior art depiction of well known conventional 3D printers **11** which employ a moving printer head or nozzle **20** to form a printed component **16** upon the printing surface **12** of a printing plate **14**. As noted, the system **10** herein is positionable for use in combination with such a 3D printer **11**. By positionable is meant the system **10** herein may be easily retrofitted to existing 3D printers **11** wherein the pivoting printer plate **14** and print surface **12** is operatively located below the print head **20**, or it may be included as part of newly manufactured or OEM 3D printers **11** in such an operative positioning.
[0045] Shown in FIGS. **4-8** are the system **10** herein positioned to operate with the pivoting or tilting print surface **12** located on a print plate **14**, where the print surface **12** will move between the horizontal or as used position of FIG. **4** and the substantially vertical positioning of FIGS. **8-9**. From the horizontal or as used positioning of FIG. **4**, once the printed component **16** is completed upon the printing surface **12** by the 3D printer **11**, in which the system herein is configured for positioning, a pivoting of the printing surface **12** toward the vertical positioning is initiated, as

shown in FIG. **5**.
[0046] The printing surface **12** is located on the printing plate **14** which is coupled to the powered or linear drive **22** providing the force to move the printing surface **12** between the horizontal and vertical positions by a carriage **18**. Preferably, this coupling of the printing plate **14** with the printing surface **12** thereon is a kinematic coupling wherein the print surface **12** will continuously be repositioned when located to the horizontal or as used positioning of FIG. **4** to a known or exact positioning below a printer head **20**, when the system **10** is located within a 3D printer **11**. Such will thereby provide high repeatability and precision each time the printing surface **12** is relocated to the horizontal or as used positioning of FIGS. **4** and **10**.
[0047] Currently, the pivoting or tilting action for the printing surface **12** to reach the substantially vertical positioning of FIGS. **6-9** and back again is provided by the coupling of the printing surface **12** to a pivotally coupled component, such as to the carriage **18**. The carriage **18** is pivotally coupled to a powered drive which provides the force and direction of movement to rotate the carriages **18** and engaged printer plate **14** between the horizontal and substantially vertical positions.
[0048] By powered drive herein is meant an electric powered drive which is configured for engagement with the printing plate **14** or carriage and is actuated to move them between the horizontal position and the vertical position as required.
[0049] For example and in no way limiting, a translating or moving mount **24**, operatively engaged with a powered drive, such as a linear drive **22**, as those noted above, may provide the powered drive. Such a linear drive **22** will translate the mount **24** to which the printing surface **12** is coupled by the carriage **18** which pivotally engages the mount **24** to provide precise repeatable positions for the printing surface **12**. This provides for the tilting of the printing surface **12** between the precise horizontal printing positioning or the as used positions, such as in FIGS. **4** and **10** and the vertical positions, as in FIGS. **6-9**.
[0050] As noted, the linear drive **22** or other means for pivoting the printer plate and printing surface **12** may be coupled to a fixed support such as support wall **23** provided with the system **10** herein, or it may be engaged with the housing **26**, either directly or to a mount connected to the house, so long as it is fixed in position.
[0051] FIG. **8** shows the detachment of the printed component from the vertically positioned printing surface of FIG. **7**. Once in the vertical positioning, such as in FIGS. **9** and **15**, the force of gravity will aid in the detachment of the printed component **16**. So detached, the printed component **16** may exit the printer housing **26** through an exit opening **28**, positioned below the vertically positioned printing surface **12** of FIG. **9**.
[0052] FIGS. **10-15** show the system **10** herein in the same movement and positioning as that of FIGS. **4-9** but are shown to include an enhanced kinematic coupling of the printing plate **14** and printing surface **12** thereon, with the carriage **18** and the printer **11** in which the system **11** is configured for positioning and use. As shown, a support mount **30** is configured to support a second end of the printing plate **14** opposite the first end thereof which is coupled to the mount **24** of the linear drive **22**.
[0053] The support mount **30** may be engaged to a fixed surface or position at a first end thereof. By fixed surface herein is meant a surface which is stationary and does not move, such as the printer housing or member or support connected thereto, whereby the support mount **30** is fixed in position. The distal end of the secondary mount **30** is configured to form a support contact with the printer plate **14** when it and the print surface **12** are in the horizontal or as used position, such as in FIGS. **4** and **10**, where printed components **16** are formed thereon.
[0054] This distal end of the secondary mount **30** may include a ball **32** which is positioned within a socket **34** located upon the printer plate **14**. Additionally, to enhance the kinematic coupling of the printer plate **14** and print surface **12** thereon to the carriage **18** and the 3D printer, the pivoting coupling **19** of the first end of the printer plate **14** to the mount **24** may include a secondary socket

36 formed on one of the mount **24** or the end of the carriage **18**, with a secondary ball **38**, formed on the other of the mount **24** or carriage **18**, as shown in FIG. **11**.
[0055] FIG. **15** shows the exit of the printed component **16** from the housing **26** of the printer **11** through an opening **28** aligned with the vertically positioned printing surface **12** located there above.
[0056] Shown in FIG. **16** are depictions of some optional detachment components which may be included with the system **10** herein. Such detachment components may be connected to the support wall **23**, when present, or to a lower side of the printer plate **14** opposite the printing surface **12**. They are preferably electrically powered by the onboard power of the printer to which the system **10** herein is positionable which would be accomplished by electric connections thereto.
[0057] Such detachment components may be one or a combination of secondary detachment components from a group of secondary detachment components including a vibration component, such as a vibration motor or haptic actuator to communicate vibration **40** to the printing surface **12**, a Peltier thermoelectric cooling chip **42** which may communicate heat or cold to the printing surface, a liquid cooled area **43**, or a conduit **44**, having a cold air supply exiting therefrom directed to contact the printing surface **12**. Once the printing surface **12** and print plate **14** reach the substantially vertical positioning of FIGS. **9** and **15**, the detachment components may be employed to assist in the release of the printed component **16** from the print surface **12**. This may be achieved by means of thermal variation, wherein the thermoelectric module **42** or conduit **44** induces cooling to lower any adhesion between the printed component **16** and the printing surface **12** or by means of vibration using the vibrator **40** to break any adhesion between the printed component **16** and the print surface **12**. Such actions will aid gravity in detaching the printed component **16** from the printing surface **12** whereby it will fall through the exit opening **28** for collection.
[0058] As noted above, while the present tilting printing surface and system **10** invention has been described herein with reference to particular embodiments thereof and steps in the method of employment of the modes thereof, a latitude of modifications, various changes and substitutions are intended in the foregoing disclosures, it will be appreciated that in some instances some features or steps in a configuration of the tilting printing surface invention could be employed without a corresponding use of other features without departing from the scope of the invention as set forth in the following claims. All such changes, alternations and modifications as would occur to those skilled in the art are considered to be within the scope of this invention as broadly defined in the appended claims.
[0059] Further, the purpose of any abstract of this specification is to enable the U.S. Patent and Trademark Office and the public generally, and especially the scientists, engineers, and practitioners in the art, who are not familiar with patent or legal terms or phraseology, to determine quickly from a cursory inspection the nature and essence of the technical disclosure of the application. Any such abstract is neither intended to define the invention of the application, which is measured by the claims, nor is it intended to be limiting, as to the scope of the invention in any way.

Claims

1. A tilting print surface for positioning within a 3D printer, comprising: a printer plate having a print surface thereon for formation of a printed component thereon; said printer plate in a pivoting coupling to a support at or adjacent a first end of said printer plate; said printer plate having a horizontal positioning locating said print surface below a print head of said 3D printer; and said printer plate moveable from said horizontal position to a substantially vertical position wherein, subsequent to a formation of a component upon said print surface by said print head, a pivoting of said printer plate to said substantially vertical position aids in the detachment of said printed component from said print surface.

2. The tilting print surface for positioning within a 3D printer of claim 1 additionally comprising: a carriage supporting said printer plate; said carriage in said pivoting coupling to said support; a powered drive engaged with said carriage; said powered drive actuable to rotate said carriage between a horizontal positioning thereof and a vertical positioning thereof; said horizontal positioning of said carriage locating said printer plate to said horizontal positioning thereof; and said vertical positioning of said carriage locating said printer plate to said substantially vertical positioning thereof.

3. The tilting print surface for positioning within a 3D printer of claim 2 wherein said powered drive comprises: a linear drive; a coupling at a first end of said carriage to said linear drive; said linear drive powered by an electric motor; and said linear drive actuable to translate said carriage between said horizontal positioning thereof and said vertical positioning thereof.

4. The tilting print surface for positioning within a 3D printer of claim 1 additionally comprising: a second mount; said second mount having a first end engaged to a fixed position; said second mount having a second end; and said second end forming a removable contact with a lower surface of said printer plate at a contact point adjacent a second end thereof opposite said first end thereof, with said printer plate located in said horizontal position thereof.

5. The tilting print surface for positioning within a 3D printer of claim 2 additionally comprising: a second mount; said second mount having a first end engaged to a fixed position; said second mount having a second end; and said second end forming a removable contact with a lower surface of said printer plate at a contact point adjacent a second end thereof opposite said first end thereof, with said printer plate located in said horizontal position thereof.

6. The tilting print surface for positioning within a 3D printer of claim 3 additionally comprising: a second mount; said second mount having a first end engaged to a fixed position; said second mount having a second end; and said second end forming a removable contact with a lower surface of said printer plate at a contact point adjacent a second end thereof opposite said first end thereof, with said printer plate located in said horizontal position thereof.

7. The tilting print surface for positioning within a 3D printer of claim 4 additionally comprising: a ball at said second end of said second mount; and a recess for receiving said ball positioned at said contact point.

8. The tilting print surface for positioning within a 3D printer of claim 5 additionally comprising: a ball at said second end of said second mount; and a recess for receiving said ball positioned at said contact point.

9. The tilting print surface for positioning within a 3D printer of claim 6 additionally comprising: a ball at said second end of said second mount; and a recess for receiving said ball positioned at said contact point.

10. The tilting print surface for positioning within a 3D printer of claim 1 additionally including: a secondary detachment component positioned adjacent to said printer plate while in said substantially vertical position; and said secondary detachment component being one or a combination of secondary detachment components from a group of secondary detachment components including, a vibration component to communicate vibration to the printing surface, a thermoelectric cooling chip for communicating heat or cold therefrom to the printing surface, a liquid cooled area, and a conduit having a cold air supply exiting therefrom directed to contact the printing surface.

11. The tilting print surface for positioning within a 3D printer of claim 2 additionally including: a secondary detachment component positioned adjacent to said printer plate while in said substantially vertical position; and said secondary detachment component being one or a combination of secondary detachment components from a group of secondary detachment components including, a vibration component to communicate vibration to the printing surface, a thermoelectric cooling chip for communicating heat or cold therefrom to the printing surface, a liquid cooled area, and a conduit having a cold air supply exiting therefrom directed to contact the

printing surface.
12. The tilting print surface for positioning within a 3D printer of claim 3 additionally including: a secondary detachment component positioned adjacent to said printer plate while in said substantially vertical position; and said secondary detachment component being one or a combination of secondary detachment components from a group of secondary detachment components including, a vibration component to communicate vibration to the printing surface, a thermoelectric cooling chip for communicating heat or cold therefrom to the printing surface, a liquid cooled area, and a conduit having a cold air supply exiting therefrom directed to contact the printing surface.
13. The tilting print surface for positioning within a 3D printer of claim 5 additionally including: a secondary detachment component positioned adjacent to said printer plate while in said substantially vertical position; and said secondary detachment component being one or a combination of secondary detachment components from a group of secondary detachment components including, a vibration component to communicate vibration to the printing surface, a thermoelectric cooling chip for communicating heat or cold therefrom to the printing surface, a liquid cooled area, and a conduit having a cold air supply exiting therefrom directed to contact the printing surface.
14. The tilting print surface for positioning within a 3D printer of claim 6 additionally including: a secondary detachment component positioned adjacent to said printer plate while in said substantially vertical position; and said secondary detachment component being one or a combination of secondary detachment components from a group of secondary detachment components including, a vibration component to communicate vibration to the printing surface, a thermoelectric cooling chip for communicating heat or cold therefrom to the printing surface, a liquid cooled area, and a conduit having a cold air supply exiting therefrom directed to contact the printing surface.
15. The tilting print surface for positioning within a 3D printer of claim 8 additionally including: a secondary detachment component positioned adjacent to said printer plate while in said substantially vertical position; and said secondary detachment component being one or a combination of secondary detachment components from a group of secondary detachment components including, a vibration component to communicate vibration to the printing surface, a thermoelectric cooling chip for communicating heat or cold therefrom to the printing surface, a liquid cooled area, and a conduit having a cold air supply exiting therefrom directed to contact the printing surface.
16. The tilting print surface for positioning within a 3D printer of claim 9 additionally including: a secondary detachment component positioned adjacent to said printer plate while in said substantially vertical position; and said secondary detachment component being one or a combination of secondary detachment components from a group of secondary detachment components including, a vibration component to communicate vibration to the printing surface, a thermoelectric cooling chip for communicating heat or cold therefrom to the printing surface, a liquid cooled area, and a conduit having a cold air supply exiting therefrom directed to contact the printing surface.
17. A tilting print surface for a 3D printer, comprising: a 3D printer having a print head for forming a printed component; a printer plate having a print surface thereon for formation of said printed component thereon; said printer plate in a pivoting coupling to a support at or adjacent a first end of said printer plate; said printer plate having a horizontal positioning locating said print surface below a print head of said 3D printer; and said printer plate moveable from said horizontal position to a substantially vertical position wherein, subsequent to a formation of a component upon said print surface by said print head, a pivoting of said printer plate to said substantially vertical position aids in the detachment of said printed component from said print surface.
18. The tilting print surface for a 3D printer of claim 17 additional, comprising: a carriage

supporting said printer plate; said carriage in said pivoting coupling to said support; a powered drive engaged with said carriage; said powered drive actuable to rotate said carriage between a horizontal positioning thereof and a vertical positioning thereof; said horizontal positioning of said carriage locating said printer plate to said horizontal positioning thereof; and said vertical positioning of said carriage locating said printer plate to said substantially vertical positioning thereof.