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DEFLECTION MEASURING DEVICE AND METHOD

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FIELD

The present invention relates to a device for measuring warping of a pallet and a method of the same.

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BACKGROUND

Wooden pallets are cheap and plentiful, and millions are in use globally every day. A typical wooden pallet is shown in Figure 1. The pallet 10 is typically made from three to six planks 12 of wood arranged in the same lengthways direction forming an upper face 16 on which goods intended to be transported can be placed or stacked goods. Typically, three to six planks 18 make a lower face 20, generally parallel to the planks 12 of the upper face 16. The faces 16, 20 are separated with thicker wood beams 14 which create sides to the pallet. The planks 12 are nailed to the beams 14 which makes them easy to repair. The location of the beams 14 provides space between the faces 16, 20 which allows the forks of forklift trucks to be inserted, to allow the pallet 10 to be lifted and carried around with ease. This means that items can be loaded on the upper face 16 and carried with ease.

Pallets are made to an agreed international standard to ensure things that carry them, such as lorries and containers for cargo ships, can carry a known number of them, the standard requiring a pallet to be 120cm long, 120cm wide, and sides a maximum of 20cm high.

A known problem with pallets is that over time, the wood can warp (i.e., twists), usually because it gets wet or carries too heavy a load too often, or gets

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damaged through misuse. While planks 12 or beams 14 can be replaced, over time, replacing them stops being effective, and warped or damaged pallets risk a load being unbalanced. In addition, a warped or damaged pallet may not be substantially flat, and therefore space is lost when the pallets are packed into lorries and the like. This loss of space results in a loss of efficiency which increases the cost.

Various methods are known in the prior art to assess pallet damage or warping. Typically, users simply visually inspect pallets and can see if there is substantial damage or warping. However, this method is not scientific and the level of warping is not accurately assessed. As such, pallets with life left in them can be disposed of too soon, or sometimes they are kept for too long.

Another method that is used is depicted in Figure 2. Where a user thinks a pallet is twisted, warped or damaged, one user will stand on a corner of a pallet, while another looks to see if any of the other corners are raised from a flat level surface 38. If they think there is too big a gap from the floor, they will dispose of the pallet. More recently, people have been using simple triangular door wedges 36, and with a user standing on a corner, another tries to push the wedge 36 under a different corner. If it goes under the pallet too far, the pallet is too warped. "Too far" means either, the wedge goes to or beyond a threshold marking made by a user part way up the angled surface of the wedge - meaning the marking cannot be seen, or the whole wedge 36 can travel under the pallet. The problem with this method is that it is not consistent.

It is therefore an object of the invention or overcome of substantially mitigate the problems associated with the prior art.

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SUMMARY

There is provided a device for measuring warping of a pallet, the device comprising: a frame comprising a flat surface configured to receive at least a partial face of a pallet, wherein the partial face comprises an edge bound by first and second adjacent corners; releasable securing means for releasably securing the first corner of the pallet to the flat surface; and measuring means for measuring the deflection of the second corner of the pallet away from the plane of the flat surface.

The device ensures consistency when measuring warping of a pallet, which is a significant improvement over the prior art. Deflection can be measured accurately and consistently in order to determine whether the pallet is too warped to continue functioning, allowing the user to make an informed decision on whether the pallet can stay in use or should be recycled, repaired or disposed of.

The term "warping" as used herein is interpreted to mean the pallet is bent, twisted or damaged in any manner which has altered the original structure of the pallet.

In some embodiments, the device further comprises alignment means for checking that the flat surface of the frame is level. This provides assurance to the user that the frame itself is not warped and is in good working order, and the flat surface is indeed flat and can be used to determine whether a pallet is warped. If the alignment means indicates that the flat surface of the frame is not level, the user can then decide to re-align, repair or replace the frame. This further ensures that the device is consistent.

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In some embodiments, the alignment means comprises at least two spirit and/or laser levels. A spirit level comprises a tube part with marks on the tube and filled with a thick liquid leaving a bubble in it. A laser level is a laser source and distal target, installed at known points on a level surface such that if the laser hits the target, the user is confident that the surface on which the laser level is on is level. Using at least two spirit and/or laser levels provides the advantage that the user can quickly confirm that the flat surface of the frame is level, which is crucial for accurate results. 1/2

In some embodiments, the at least two spirit and/or laser levels are distanced apart along one edge of the frame. This improves the accuracy of the level reading.

In some embodiments, the device comprises a plurality of releasable securing means for releasably securing different corners of the pallet to the flat surface. This means that different corners of the pallet can be secured to the frame without needing to rotate the pallet in the frame. This saves time and energy. 1

In some embodiments, the releasable securing means is a clamp. Clamps are ideal releasable securing means because they can be used to quickly secure and release the corner of the pallet to/from the flat surface. In addition, clamps are advantageous because they have low maintenance requirements. 1/2

In some embodiments, the partial face comprises first, second and third corners of the pallet. This provides the advantage that when a pallet corner is secured to the flat surface, deflection of both adjacent corners can be measured without needing to reorientate the pallet. This saves time and energy.

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In some embodiments, the flat surface is configured to receive the whole face of the pallet. This provides the advantage that the deflection of all corners of the pallet can be measured without needing the reorientate the pallet. This saves time and energy. Preferably, the frame is dimensioned to receive a conventional pallet.

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In some embodiments, the measuring means comprises an upright element that is orthogonal (i.e., 90 degrees) to the plane of the flat surface. This provides the advantage that the deflection of a corner can be visually assessed to the upright element.

In some embodiments, the upright comprises a marker to indicate a threshold level of deflection. This provides the advantage that the user can visually compare the deflection of the corner against the marker and assess whether the amount of deflection of the corner is over or under the deflection threshold. This means that the user can easily determine whether the level of deflection is acceptable (i.e., under the marker) or not acceptable (i.e., over the marker). The marker helps to ensure consistency in this determination.

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In some embodiments, the marker is moveable on the upright. The user can therefore set the marker to an appropriate threshold level of deflection, which is advantageous because different users may have different thresholds. This makes it easier to use the device with different threshold levels.

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In some embodiments, the marker is arranged to be locked in position on the upright. This provides the advantage that the user can lock the moveable marker to a set threshold level.

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In some embodiments, the measuring means comprises a wedge. This helps the user see how much deflection there is.

In some embodiments, the wedge comprises one or more markers to indicate a threshold level of deflection. This helps the user see how much deflection there is.

In various embodiments, the measuring means comprises an upright element as described above and a wedge as described above.

In some embodiments, the measuring means comprises a laser level. This provides the advantage that the user can quickly and accurately check whether a pallet edge is warped.

In some embodiments, the frame is made from a substantially rigid material. This provides the advantage that the frame is light so that one person can use it and strong so that the frame itself does not warp or deflect.

In some embodiments, the substantially rigid material is steel or composite. This provides the advantage that the frame is light so that one person can use it and strong so that the frame itself does not warp or deflect.

There is also provided a method of measuring warping of a pallet, the method comprising: releasably securing a first corner of a pallet to the flat surface of a device described herein; and measuring the deflection of one or more adjacent corners of the pallet away from the plane of the flat surface using the measuring means.

The method ensures consistency when measuring warping of a pallet, which is a significant improvement over the prior art. Deflection can be measured

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accurately and consistently in order to determine whether the pallet is too warped to continue functioning, allowing the user to make an informed decision on whether the pallet can stay in use or should be recycled. 1

In some embodiments, the method further comprises the steps of: releasing the releasable securing means, thereby detaching the pallet from the frame;

flipping the pallet by 180 degrees; releasably securing one of the corners of the pallet to the flat surface; and measuring the deflection of one or more adjacent corners of the pallet away from the plane of the flat surface using the measuring means.

This provides the advantage that warping of the pallet can still be determined even if in one orientation, one edge of the pallet is curved downwards towards the flat surface. 1

In some embodiments, the method further comprises the steps of: releasing the releasable securing means, thereby detaching the pallet from the frame; rotating the pallet by 90 degrees or more; releasably securing one of the corners of the pallet to the flat surface; measuring the deflection of one or more adjacent corners of the pallet away from the plane of the flat surface using the measuring means. 1/2

This provides the advantage that all corners of the pallet are assessed for deflection.

BRIEF DESCRIPTION OF THE DRAWINGS

One or more embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

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Figure 1 shows a perspective view of a pallet encompassed by the prior art.

Figure 2 shows a side view of a setup where a user is stepping on a corner of a pallet in order the assess warping of the pallet, which is encompassed by the prior art.

Figure 3 shows a perspective view of an exemplary embodiment of the device according to the invention.

Figure 4 shows a side view of an exemplary embodiment of a device according to the invention, showing a curved pallet secured on the frame.

Figure 5 shows a side view of an exemplary embodiment of a device according to the invention, showing a curved pallet secured on the frame. The curved pallet is flipped 180 degrees compared to the pallet shown in Figure 4.

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DETAILED DESCRIPTION

An exemplary embodiment of the device according to the invention is shown in Figure 3.

The device 50 has a rectangular frame 52 that is substantially the same size as a conventional pallet. The term "frame" is known to one skilled in the art. The frame is formed from steel or composite. The frame 52 has a large flat surface 54 on to which a pallet (not shown) can be placed. A clamp 56 is located at one corner of the frame 52, which can be wound down to secure a corner of the pallet to the frame 52. It will be appreciated that multiple securing mechanisms (e.g., clamps) may be present at different corners of the frame 52.

An upright element 58 is located at an adjacent corner of the frame 52. The upright element 58 is a cuboid extending upwards orthogonally from the plane of

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the flat surface 54. A moveable marker 60 is slidable up and down on the upright element 58 and is used to set a threshold deflection level to act as a visual indicator of deflection. The moveable marker 60 can be locked into position on the upright element 58.

Located in the same corner of the frame 52 is a triangular wedge 62 having multiple threshold markings that can alternatively or additional be used as a visual indicator or deflection.

Two spirit levels 64 are located on the frame 52 in parallel along one longitudinal edge. The spirit levels 64 are distanced apart such that one spirit level 64 is located near one corner of the frame 52 and the other spirit level 64 is located near an adjacent corner of the frame 52. It will be appreciated that the spirit levels 64 may be substituted for laser levels.

In alternative or additional embodiments, the frame 52 includes a laser level having a laser source and a distal target for measuring the deflection of the edges of the pallet 94 from the flat surface 54.

Figures 4 and 5 show an exemplary embodiment of the device in use.

As shown in Figure 4, a pallet 74 is inserted into the frame of the device 70. A corner of a pallet 74 is secured to the flat surface 72 of the device 70 by actuating the clamp 76, such that the clamp 76 urges the pallet 74 against the flat surface 72. The user then inspects the two adjacent corners connected to the clamped corner and uses the measuring means 78 to check the deflection of the edges or corners of the pallet 74 compared to the flat surface 72. If the corner

deflects higher than the threshold marker 80, the pallet 74 is considered to be too warped for continued use, and can be sent for repair or thrown away.

It will be appreciated that the user may wish to release the clamp 76 and rotate the pallet 74 by 90 degrees or more, to check the other corners in a similar manner.

In the case of Figure 4, the pallet 74 is clearly warped but is not deflecting higher than the threshold marker 80. In this case, the user can release the clamp 76 and can flip the pallet 74 by 180 degrees.

The device 90 in Figure 5 is identical to the device 70 in Figure 4, however the pallet 94 in Figure 5 is flipped by 180 degrees. The user can resecure the pallet 94 to the flat surface 92 using the clamp 96. It will be appreciated that the same corner or a different corner could be secured. Deflection of the adjacent corner of the pallet 94 can clearly be observed and measured using the upright element 98 and the threshold marker 100. As can be seen in Figure 5, the corner deflects away from the flat surface 92 a greater distance than the threshold marker 100. Accordingly, the pallet 94 is considered to be too warped for continued use, and can be sent for repair or thrown away.

Although the invention has been described above with reference to one or more preferred embodiments, it will be appreciated that various changes and modification may be made without departing from the scope of the invention as defined in the appended claims.

MARKS AWARDED: 22.5/40

CLAIMS

1. A device for measuring warping of a pallet, the device comprising:

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a frame comprising a flat surface configured to receive at least a partial face of a pallet, wherein the partial face comprises an edge bound by first and second adjacent corners;

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releasable securing means for releasably securing the first corner of the pallet to the flat surface; and

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measuring means for measuring the deflection of the second corner of the pallet away from the plane of the flat surface.

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2. A device according to claim 1, further comprising alignment means for checking that the flat surface of the frame is level.

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3. A device according to claim 2, wherein the alignment means comprises at least two spirit and/or laser levels.

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4. A device according to claim 3, wherein the at least two spirit and/or laser levels are distanced apart along one edge of the frame.

5. A device according to any preceding claim, wherein the device comprises a plurality of releasable securing means for releasably securing different corners of the pallet to the flat surface.

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6. A device according to any preceding claim, wherein the releasable securing means is a clamp.

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7. A device according to any preceding claim, wherein the partial face comprises first, second and third corners of the pallet.

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8. A device according to any preceding claim, wherein the flat surface is configured to receive the whole face of the pallet.

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9. A device according to any preceding claim, wherein the measuring means comprises an upright element that is orthogonal to the plane of the flat surface. 1

10. A device according to claim 9, wherein the upright element comprises a marker to indicate a threshold level of deflection. 1

11. A device according to claim 10, wherein the marker is moveable on the upright. 1/2

12. A device according to claim 11, wherein the marker is arranged to be locked in position on the upright element. 1/2

13. A device according to any one of claims 9-12, wherein the measuring means further comprises a wedge. 1/2

14. A device according to any preceding claim, wherein the measuring means comprises a wedge.

15. A device according to claim 13 or claim 14, wherein the wedge comprises one or more markers to indicate a threshold level of deflection. 1

16. A device according to any preceding claim, wherein the measuring means comprises a laser level. 1

17. A device according to any preceding claim, wherein the frame is made from a substantially rigid material. 1

18. A device according to claim 17, wherein the substantially rigid material is steel or composite. 1/2

19. A method of measuring warping of a pallet, the method comprising:

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releasably securing a first corner of a pallet to the flat surface of a device according to any one of claims 1-18; and

measuring the deflection of one or more adjacent corners of the pallet away from the plane of the flat surface using the measuring means. 2.5

20. A method according to claim 19, further comprising the steps of:

releasing the releasable securing means, thereby detaching the pallet from the frame; 1

flipping the pallet by 180 degrees; 1

releasably securing one of the corners of the pallet to the flat surface; and 1

measuring the deflection of one or more adjacent corners of the pallet away from the plane of the flat surface using the measuring means. 2

21. A method according to claim 19 or claim 20, further comprising the steps of:

releasing the releasable securing means, thereby detaching the pallet from the frame;

rotating the pallet by 90 degrees or more; 3

releasably securing one of the corners of the pallet to the flat surface; and

measuring the deflection of one or more adjacent corners of the pallet away from the plane of the flat surface using the measuring means. 1

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ABSTRACT

DEFLECTION MEASURING DEVICE AND METHOD

A device 50 for measuring warping of a pallet. The device 50 includes a frame 52 having a flat surface 54 configured to receive at least a partial face of a pallet, wherein the partial face comprises an edge bound by first and second adjacent corners; releasable securing means 56 for releasably securing the first corner of the pallet to the flat surface 54; and measuring means 58 for measuring the deflection of the second corner of the pallet away from the plane of the flat surface 54. The device 50 can be used to consistently determine whether a pallet is warped and whether the pallet should stay in operation or be recycled.

Also provided is a method of measuring warping of a pallet, the method including: releasably securing a first corner of a pallet to the flat surface 54 of a device 50 described herein; and measuring the deflection of one or more adjacent corners of the pallet away from the plane of the flat surface 54 using the measuring means 58.

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To be accompanied by Figure 3

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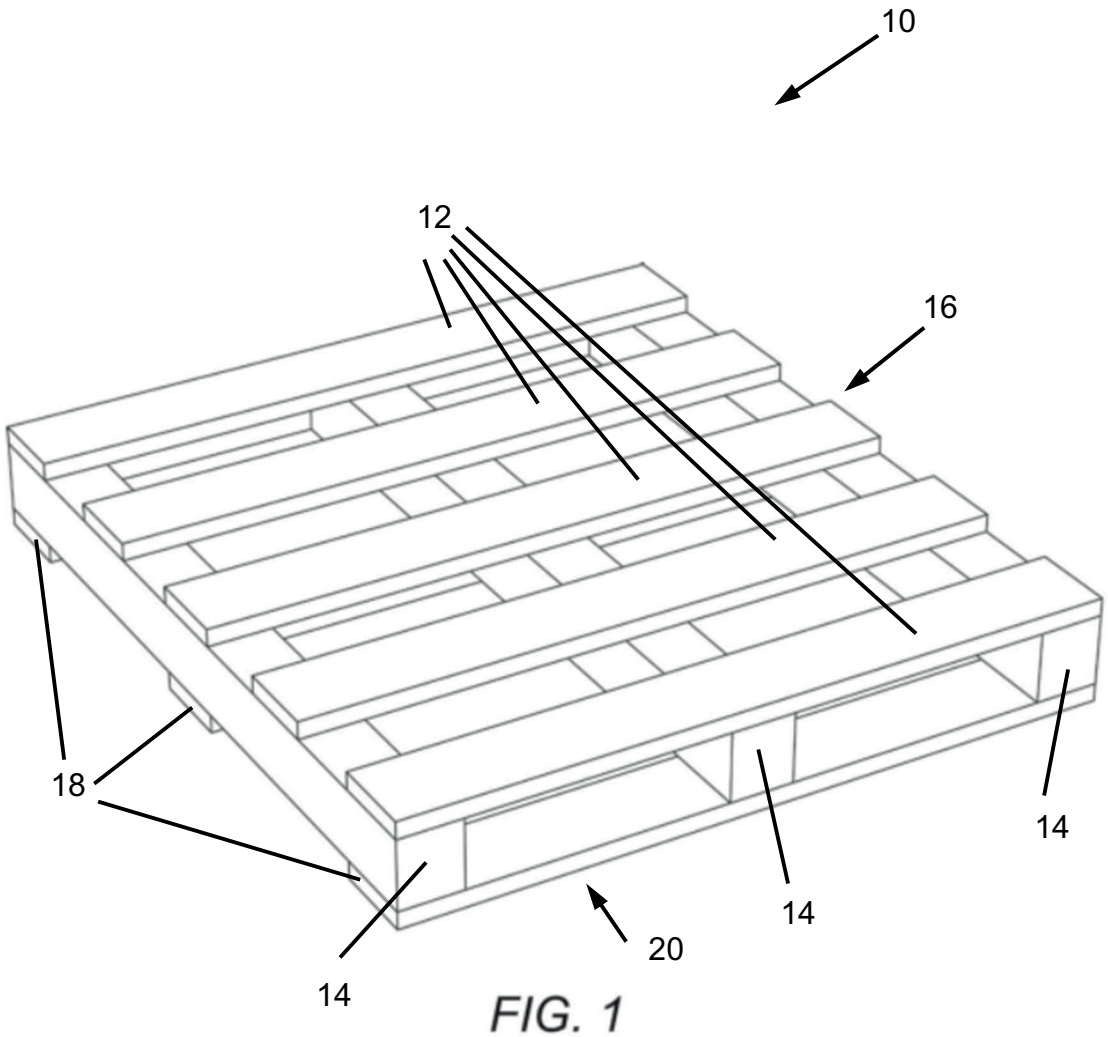

FIG. 1

PRIOR ART

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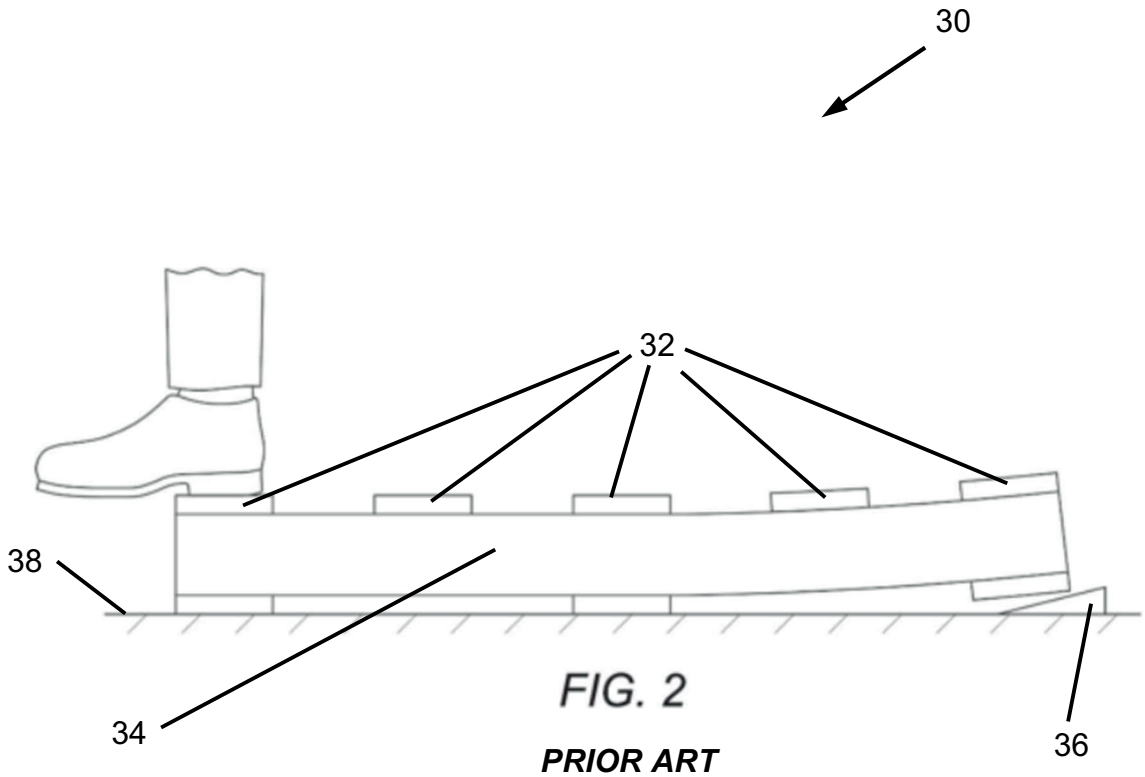

FIG. 2

PRIOR ART

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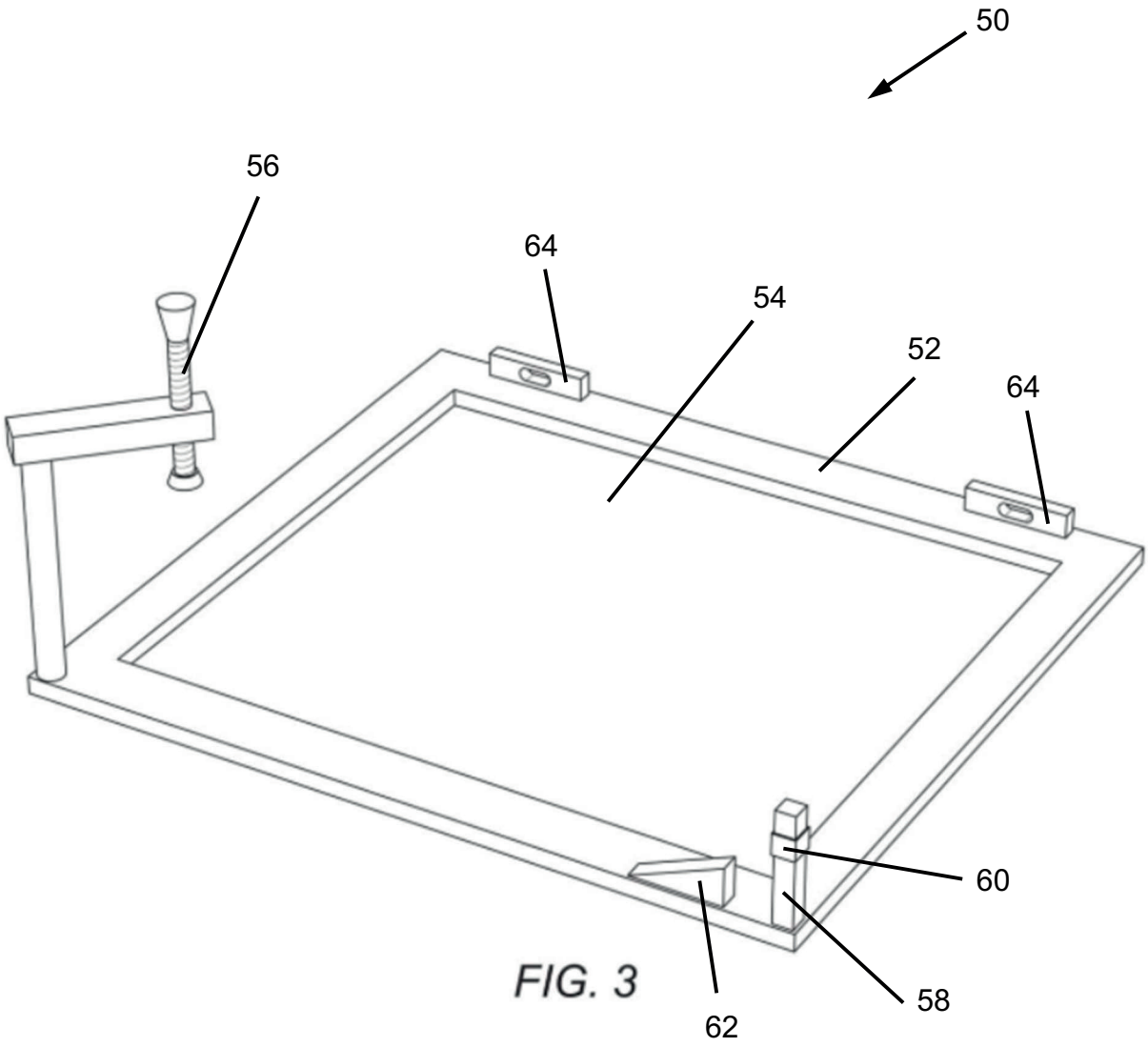

FIG. 3

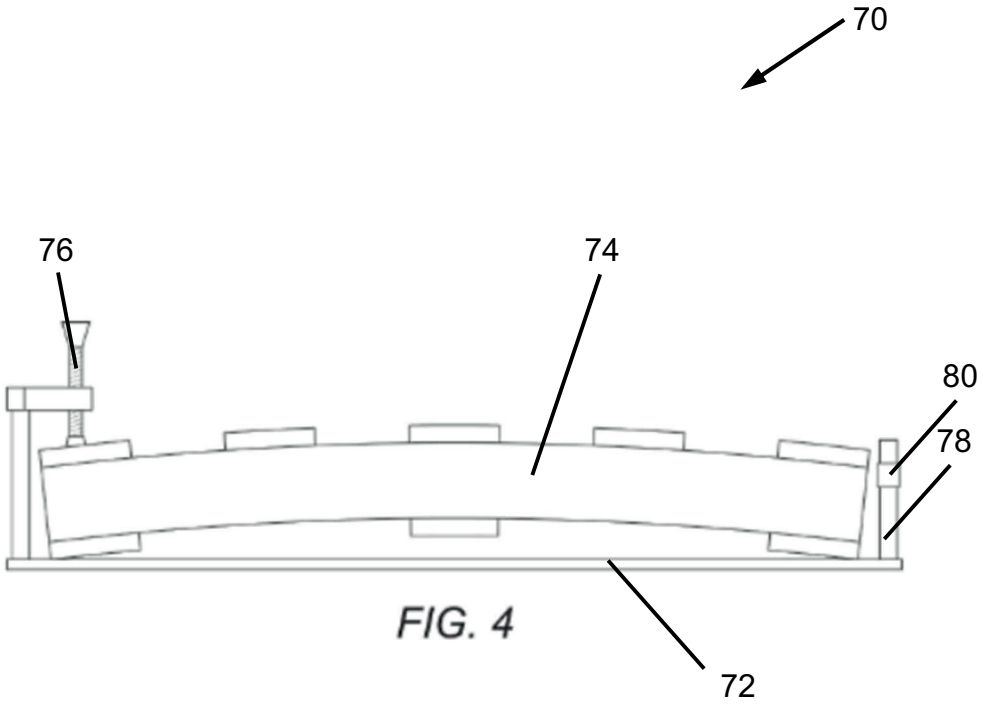

FIG. 4

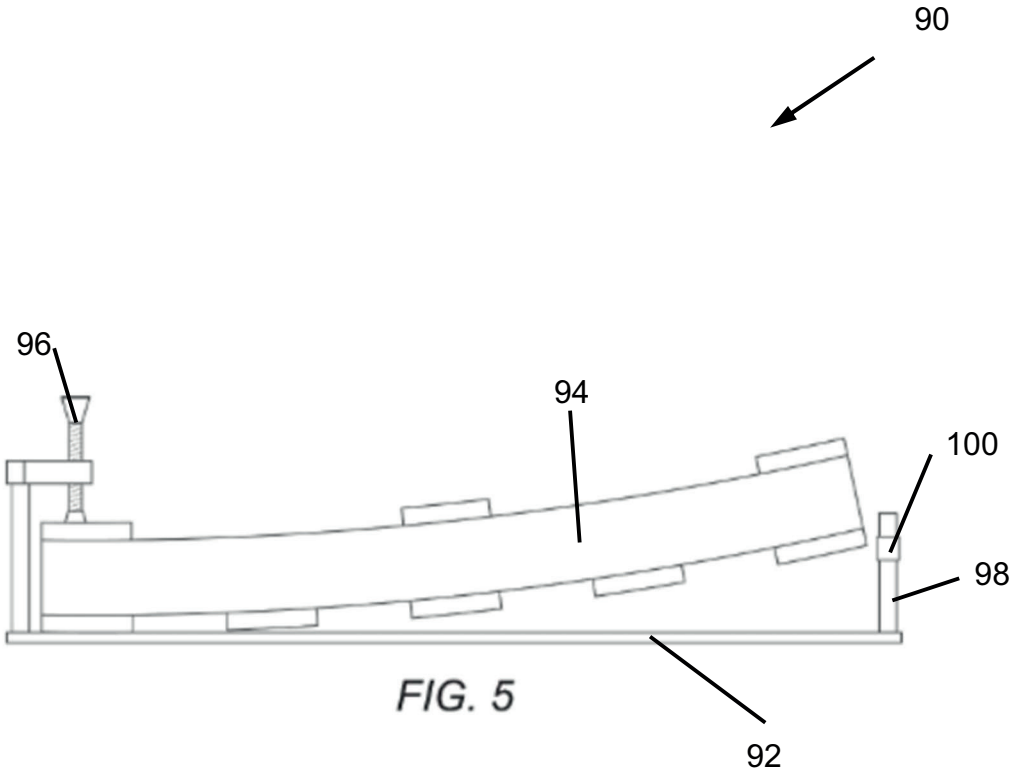

FIG. 5