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STANDOFF FOR DUCTWORK DAMPER ASSEMBLY, DUCTWORK DAMPER ASSEMBLY INCORPORATING SAME AND METHOD OF ASSEMBLING DUCTWORK DAMPER ASSEMBLY

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ABSTRACT

A standoff for a ductwork damper assembly includes a plate member and first and second leg members extending orthogonally from respective opposing sides of the plate member, the plate member having an aperture for receiving a pivot rod of a damper of the ductwork assembly, wherein the standoff is adapted for mounting on an outer surface of a section of ductwork of the ductwork damper assembly in the absence of fasteners at a site of contact between the first and second leg members and the surface of the section of ductwork.

STANDOFF FOR DUCTWORK DAMPER ASSEMBLY, DUCTWORK DAMPER ASSEMBLY INCORPORATING SAME AND METHOD OF ASSEMBLING DUCTWORK DAMPER ASSEMBLY

FIELD OF THE INVENTION

[0001] The present invention relates to improved standoffs for ductwork damper assemblies of heating and cooling ductwork systems. The invention also relates to improved ductwork and ductwork damper assemblies which incorporate such standoffs.

BACKGROUND OF THE INVENTION

[0002] It is well known in ducted heating, ventilating or air conditioning systems to provide, at selected locations, regulating damper assemblies for controlling the rate of flow of air or the like through the ducts of the HVAC system. Such known ductwork damper assemblies generally include a damper blade made of sheet metal and dimensioned to conform substantially to the cross-section of the air duct intended for passage of air or the like in a regulated manner. In general, the damper blade has a circular shape and is fitted in a circular air duct of slightly larger diameter to permit pivotal rotation of the damper blade.

[0003] The damper blade is rotatably attached to a shaft (i.e., pivot rod) which is itself rotatably connected to the duct by bearing-type bushings, such that the damper blade is pivotable within the duct as the shaft is rotated. One end of the pivot rod extends outwardly from the duct and is pivotally rotatable through an actuator, for example a lever, to one of a number of selected angular orientations to control the airflow through the duct. The ductwork oftentimes also includes a standoff for mounting the lever at an increased distance from the ductwork section which facilitates access to the lever when the ductwork is surrounded by insulating material.

[0004] Conventional standoffs are connected to the outer surface of the ductwork at the site of contact between the standoff and the ductwork by fastening means, for example by rivets or spot welds.

[0005] It is an object of the present invention to provide an improved damper unit that offers a more economical and cost-effective securement of the standoff on the ductwork.

SUMMARY OF THE INVENTION

[0006] According to one aspect of the invention, a standoff for a ductwork damper assembly, includes a plate member and first and second leg members extending orthogonally from respective opposing sides of the plate member, wherein the plate member has a substantially central aperture for receiving a pivot rod of a damper received in a section of ductwork of the ductwork damper assembly, wherein the standoff is adapted for mounting on an outer surface of a section of ductwork of the ductwork damper assembly in the absence of fasteners at a site of contact between the first and second leg members and the surface of the section of ductwork.

[0007] According to another aspect of the invention, a ductwork damper assembly comprises

a section of ductwork;

a damper plate attached to a pivot rod, said damper plate pivotably mounted in the section of ductwork via the pivot rod, with an end of the pivot rod radially extending from the section of ductwork;

a standoff comprising a plate member and first and second leg members extending orthogonally from respective opposing sides of the plate member, said plate member having a substantially central aperture, said first and second leg members of the standoff in contact with an outer surface of the ductwork section, said pivot rod extending through the substantially central aperture of the plate member;

a handle mounted on the end of the pivot rod in rotative fixed relation with the pivot rod; and

a member threadably engaged on threads provided on the end of the pivot rod so as to bias the standoff against the outer surface of the ductwork section, the standoff being held on the ductwork section in the absence of any fastening means at a site of contact between the standoff and the outer surface of the ductwork section.

[0008] According to another aspect of the invention, a method of assembling a ductwork damper assembly includes the steps of

providing a standoff assembly, said standoff assembly comprising a standoff which comprises

a plate member and first and second leg members extending orthogonally from respective opposing sides of the plate member, said plate member having a substantially central aperture,

a first threaded member received in the substantially central aperture of the standoff, said threaded member having a central through opening and an external threading, and

a second threaded member having an internal threading and threadably received on the external threading of the first threaded member;

mounting the standoff assembly on a pivot rod of a damper plate arranged in a section of ductwork so that the pivot rod is received in the through opening of the first threaded member; and

engaging a third threaded member on a threaded end of the pivot rod.

[0009] According to a further aspect of the invention, a standoff assembly for a ductwork damper assembly, comprises

a standoff which comprises a plate member and first and second leg members extending orthogonally from respective opposing sides of the plate member, said plate member having a substantially central aperture,

a first threaded member received in the substantially central aperture of the standoff, said threaded member having a central through opening and an external threading, and

a second threaded member having an internal threading and threadably received on the external threading of the first threaded member.

[0010] According to another aspect of the present invention, the end of the pivot rod has a shape that prevents disengagement of the third threaded member form the end of the pivot rod after the third threaded member is engaged thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The above and other advantages of the invention will be further described and appreciated by those skilled in the art by reference to the following detailed description of the invention, the claims and the appended drawings in which:

[0012] FIG. 1 is an exploded perspective view of a damper unit for ductwork according to the present invention;

[0013] FIG. 2 is a perspective view of the assembly of FIG. 1, after the washer and handle have been received on the pivot rod and the wingnut has been threadably engaged to the threaded end of the pivot rod;

[0014] FIG. 3 is an internal view of an embodiment of a ductwork section with damper plate;

[0015] FIG. 4. Shows the embodiment of FIG. 3 in a view taken along the direction indicated by the arrow A;

[0016] FIG. 5 shows an exploded view of an embodiment of the damper unit according to the invention with the ductwork section and damper of FIG. 3;

[0017] FIG. 6 shows the embodiment of FIG. 5 in the assembled state;

[0018] FIG. 7 shows an enlarged front side perspective view of the lever of the embodiment of FIG. 6;

[0019] FIG. 8 shows an enlarged front perspective view of the lever of the embodiment of FIG. 6;

[0020] FIG. 9 is a detail side perspective view of the embodiment shown in FIG. 6, illustrating engagement of the lever on the threaded end of the pivot rod;

[0021] FIG. 10 is a front side perspective view of a standoff assembly according to an embodiment of the invention;

[0022] FIG. 11 is a bottom perspective vow of the standoff assembly shown in FIG. 10 taken in the direction indicated by arrow B;

[0023] FIG. 12 is a top, plan view of the standoff shown in FIG. 10;

[0024] FIG. 13 is a side, plan view of the standoff shown in FIG. 10;

[0025] FIG. 14 is a front, plan view of the standoff shown in FIG. 10;

[0026] FIG. 15 is a front side perspective view of the threaded member shown in FIG. 10;

[0027] FIG. 16 is a front plan view of the threaded member of FIG. 15;

[0028] FIG. 17 is a front side perspective view of the handle shown in FIG. 10;

[0029] FIG. 18 is a front plan view of the handle shown in FIG. 17;

[0030] FIG. 19 Is a front side perspective view of another embodiment of a damper assembly in accordance with the invention;

[0031] FIG. 20 is a front side perspective view of another embodiment of a damper assembly in accordance with the invention;

[0032] FIG. 21 is an enlarged view of the encircled portion of FIG. 20;

[0033] FIG. 22 is a cross sectional view of the pivot rod and threaded member shown in FIG. 21.

[0034] FIG. 23 is schematic illustration of a stamped damper plate with c-shaped pivot rod having a bent end;

[0035] FIG. 24 is a view of the pivot rod of FIG. 23 taken in the direction of arrow C; and

[0036] FIG. 25 is the pivot rod of FIG. 24 with the threaded member engaged on the pivot rod.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0037] FIG. 1, shows an exploded view of an embodiment of a damper assembly 100 according to the present invention. A damper plate 2 is rotatably attached to a pivot rod 3, which is itself rotatably mounted in the section of ductwork 1 by bearing type bushings 5, such that the damper blade 2 is pivotable within the section of ductwork 1 as the pivot rod 3 is rotated. One end 4 of the pivot rod 3 extends outwardly from the section of ductwork 1. A standoff 6 in the form of a U-shaped bracket is positioned on the outer surface of the section of ductwork 1 so that the pivot rod 3 extends through a substantially central opening 7a of the standoff 6.

[0038] The embodiment sown in FIG. 1 also includes a washer 10, and a lever 20 each having respective openings 13, 22 that conform to the cross-sectional shape of the pivot rod 3 for reception of the washer and lever on the pivot rod 3. Further provided is a wingnut 30 for threaded engagement on the threaded end 4 of the pivot rod 3. The washer may be a metal ring or include a circular rubber pad 11 joined to a circular metal plate along adjacent surfaces.

[0039] FIG. 2 shows the damper assembly 100 of FIG. 1 with the washer 10, lever 20 and wingnut 30 received on the end 4 of the pivot rod 3. The wingnut 30 is tightened so as to urge the lever 20 and washer 10 against the standoff 6 thereby biasing the standoff 6 against the outer surface of the section of ductwork 1. The lever 20 is received on the pivot rod 3 in rotative fixed relation with the pivot rod 3 so that pivoting of the lever 20 causes rotation of the pivot rod 3 and as a result pivoting of the damper plate in the section of ductwork 1.

[0040] The standoff 6 is held on the section of ductwork 1 in the absence of any fastening means at the sites of contact between the standoff 6 and the surface of the section of ductwork 1. In particular, the standoff 6 is held on the surface of the section of ductwork 1 without the provision of any positive connection or material connection between the standoff 6 and the surface of the section of ductwork 1.

[0041] In the embodiment of the damper assembly shown in FIGS. 1 and 2, the pivot rod 3 has a substantially square cross section. Embodiments with other cross-sectional shapes of the pivot rod are also within the scope of the invention. FIGS. 3 – 6 illustrate an embodiment of a damper assembly 200 according to the invention in which the pivot rod 3 has a c-shaped cross section. Referring to FIG. 3, the damper plate 2 in this embodiment is a stamped sheet metal part with integral pivot rod 3. The damper plate 2 and the pivot rod are made from the same sheet metal blank during a stamping process. During the stamping process, the damper plate 2 is also provided with indentations 2a (only one of the indentations is indicated

by reference numeral) for increased rigidity of the damper plate 2. FIG. 4 shows the c-shaped cross section of the pivot rod 3.

[0042] FIG. 5 shows an exploded view of the embodiment of the damper 200 assembly in which the pivot rod 3 has a c-shape cross section. This embodiment also includes a standoff 6 with a central aperture 7a, a lever 20, a washer 10 and a wingnut 30. FIG. 6 shows the components of the damper assembly of FIG. 5 in the assembled state.

[0043] FIGS. 7 and 8 show a detailed view of the lever of the embodiment of the damper assembly shown in FIG. 6. The lever has an opening 20 for receiving the pivot rod 3. The lever 20 further has a tongue 20b that engages in the concave side of the c-shaped pivot rod 3 as shown in FIG. 9 so as to enable rotation of the pivot rod 3 via rotation of the lever 20.

[0044] Referring again to FIG. 3, the damper assembly may further include a washer 2b provided on a portion of the pivot rod 3 that extends inside the section of ductwork 1. The washer 2b acts as a spacer between the circumference of the damper plate 2 and the inner surface of the section of ductwork 1 and thus prevents contact between the circumference of the damper plate and the inner surface of the section of the ductwork 1. This advantageously reduces the frictional forces between the damper plate 2 and the inner surface of the section of ductwork 1 when the wingnut 30 is tightened and causes the damper plate to be biased against the inner surface of the section of ductwork 1.

[0045] Referring now to FIG. 10, there is shown a front side perspective view of an embodiment of a handle assembly 60 in accordance with the present invention. The handle assembly 60 includes standoff 6, threaded member 50, lever 20 and wingnut 30.

[0046] Referring to FIGS. 10-14, the standoff 6 of the handle assembly 60 includes a plate member 7a and first and second leg members 8a, 8b that terminate

in respective bent feet 9a, 9b. The standoff further has gussets 7b formed in the edges along which the plate member 7a is connected with the leg members 8a, 8b. The gussets 7b increase resistance against bending of the legs 8a, 8b away from each other. As shown in FIG. 12, the standoff 6 further includes a raised circular central portion 7c, which increases rigidity of the plate member 7a. The angle β formed between the legs 8a, 8b and the plate member 7a is preferably 90º. The angle α of the feet 9a, 9b with respect to the legs 8a, 8b may vary and can be selected depending on the diameter of the section of ductwork. In a currently preferred embodiment, the angle α is 120º. Embodiments of the standoff 6 in which the leg members 8a, 8b are configured straight, i.e., without bent feet, are also within the scope of the present invention.

[0047] FIGS. 15-16, show the threaded member 50 of the handle assembly 60. FIG. 15 shows a front side perspective view and FIG. 16 a front plan view of the threaded member 50. The threaded member 50 has a threaded portion 52 and a flange 51. The threaded portion 52 is provided with a C-shaped through opening 53 and diametrically opposed grooves 52a, 52b that extend axially along the threaded portion 52.

[0048] FIGS. 17 and 18 show the lever 20 of the handle assembly 60. FIG. 17 shows a front side perspective view and FIG. 18 a front plan view of the lever 20. The lever has a through opening 20a for receiving the threaded portion 52 of the threaded member 50. In the opening 20a, notches 20b, 20c are formed for engagement in the grooves 52a, 52b of the threaded portion 52.

[0049] Referring again to FIGS. 10-11, the handle assembly 60 I shown in the assembled state. In the assembled state of the handle assembly 60, the threaded portion 52 of the threaded member 50 is received in the central aperture 7a of the standoff 6 and the lever 20 is received on the threaded portion 52 so that the notches 20b, 20c engage in the grooves 52a, 52b of the threaded portion 52. The flange 51 of the threaded member 50 is received in the circular raised portion 7c of the standoff 6. Engagement of the wingnut 30 on the threaded portion 52 secures

the lever 20 on the threaded portion 52. The threaded member 50 can be rotated about axis A-A by pivoting of lever 20.

[0050] FIG. 19 shows an embodiment of a damper assembly 300 which includes the handle assembly 60. The handle assembly is mounted on the section of ductwork 1 so that the pivot rod 3 of the damper plate of the section of ductwork 1 is received in the through opening 53. A further threaded member, for example a hex nut 31 or further wingnut, is then engaged on the threaded end of the pivot rod 3 and tightened, whereby the handle assembly 60, and with this the standoff 6, is biased against the outer surface of the section of ductwork 1. As in the damper assembly 100 shown in FIG. 1, the standoff 6 of the handle assembly 60 is held on the section of ductwork 1 in the absence of any fastening means at the sites of contact between the standoff 6 and the surface of the section of ductwork. In particular, the standoff 6 of the handle assembly 60 is held on the surface of the section of ductwork without the provision of any positive connection or material connection at the sites of contact, between the standoff 6 and the surface of the section of ductwork 1, in particular between the legs and feet of the standoff and the surface of the section of ductwork 1.

[0051] In another embodiment, the handle assembly 60 can further include the threaded member 31. This has the advantage that the threaded member 31 does not have to be separately located and can be readily engaged on the pivot rod 3 after mounting of the handle assembly 60 on the section of ductwork 1.

[0052] The threaded member 50 of the handle assembly 60 has a c-shaped through opening for reception of a correspondingly c-shaped pivot rod. The pivot rod and the through opening of the threaded member 50 can have any cross-sectional shape, so long as engagement of the pivot rod in the through opening results in rotative fixed relation between the pivot rod and the threaded member 50. For example, the pivot rod and the through opening can have a square cross section.

[0053] In an embodiment of the damper assembly, the end of the pivot rod can have means for preventing disengagement of the threaded member from the pivot rod after engagement of the threaded member on the end 4 of the pivot rod 3. FIG. 20 shows a front side perspective view of an embodiment of ductwork damper assembly 400 in which the pivot rod 3 has a square cross section and its end 4 is provided with tongues 4a. FIG. 21 shows an enlarged view of the section of FIG. 20 indicated by the dashed line box. FIG. 22 a schematic cross-sectional view of the threaded member 30 and the pivot rod 4 of FIG. 21. The tongues 4a are attached with one of their ends to the terminus of the end 4 of the pivot rod 3 and extend at an angle relative to the pivot rod so that their free end is positioned spaced apart from the pivot rod 3. The tongues 4a are resiliently movable relative to the pivot rod so that when the threaded member 30 is pushed onto the end 4 of the pivot rod 3, their free ends are moved toward the pivot rod (see dashed lines in FIG. 22) and thus permit passage of the threaded member 30 over the tongues 4a. When the threaded member 30 has passed the tongues 4a, the free ends of the tongues 4a move radially outwardly again and prevent disengagement of the threaded member 30 from the pivot rod 3.

[0054] When the pivot rod has a c-shaped cross section, only a single tongue may be provided on the convex side of the pivot rod. Advantageously, the end of the c-shaped pivot rod 3 has in this case a flat portion on its convex side similar to the flat portion of the end 4 of the square pivot rod 3 shown in FIG. 21. The tongue 4a can then be provided on the flat portion in a manner similar to the embodiment shown in FIGS. 21 and 22.

[0055] In another embodiment, the end 4 of the pivot rod 3 can be shaped to provide a structure that prevents disengagement of the threaded member 30 form the pivot rod 3. In an embodiment, the end of the stamped damper plate 2 of the embodiment of the damper assembly 200 can be shaped during the stamping process so that the free end of the pivot rod 3 points toward the damper plate 2 as shown in FIG. 23 and is resiliently movable toward the central longitudinal axis of the pivot rod as illustrated in FIG. 24 by the dashed lines. This permits passage of the

threaded member 30 over the free end 4c. When the threaded member 30 has passed the free end 4c, the free end moves radially outwardly again and prevents disengagement of the threaded member 30 from the pivot rod 3.

[0056] While the invention has been illustrated and described in connection with currently preferred embodiments shown and described in detail, it is not intended to be limited to the details shown since various modifications and structural changes may be made without departing in any way from the spirit and scope of the present invention. The embodiments were chosen and described in order to explain the principles of the invention and practical application to thereby enable a person skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated.

[0057] What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims and includes equivalents of the elements recited therein:

CLAIMS

1. A standoff for a ductwork damper assembly, said standoff comprising:

a plate member and first and second leg members extending orthogonally from respective opposing sides of the plate member, said plate member having an aperture for receiving a pivot rod of a damper of the ductwork assembly, wherein said standoff is adapted for mounting on an outer surface of a section of ductwork of the ductwork damper assembly in the absence of fasteners at a site of contact between the first and second leg members and the surface of the section of ductwork.

2. The standoff of claim 1, further comprising at least one gusset formed in a corner at which the first and/or second leg members are connected to the plate member.

3. The standoff of claim 1, wherein the plate member has a raised portion protruding in a direction perpendicular to a flat surface of the plate member.

4. A ductwork damper assembly, comprising:

a section of ductwork;

a damper plate attached to a pivot rod, said damper plate pivotably mounted in the section of ductwork via the pivot rod, with an end of the pivot rod radially extending from the section of ductwork;

a standoff comprising a plate member and first and second leg members extending orthogonally from respective opposing sides of the plate member, said plate member having a substantially central aperture, said first and second leg members of the standoff in contact with an outer surface of the ductwork section, said pivot rod extending through the substantially central aperture of the plate member;

a handle mounted on the end of the pivot rod in rotative fixed relation with the pivot rod; and

a member threadably engaged on threads provided on the end of the pivot rod so as to bias the standoff against the outer surface of the ductwork

section, the standoff being held on the ductwork section in the absence of any fastening means at a site of contact between the standoff and the outer surface of the ductwork section.

5. A handle assembly for a ductwork damper assembly, said handle assembly comprising:

a standoff which comprises a plate member and first and second leg members extending orthogonally from respective opposing sides of the plate member, said plate member having a substantially central aperture,

a first threaded member received in the substantially central aperture of the standoff, said threaded member having a central through opening and an external threading, and

a second threaded member having an internal threading and threadably received on the external threading of the first threaded member

6. A method of assembling a ductwork damper assembly includes the steps of
   a) providing a handle assembly, said handle assembly comprising

   a standoff which comprises a plate member and first and second leg members extending orthogonally from respective opposing sides of the plate member, said plate member having a substantially central aperture,

   a first threaded member received in the substantially central aperture of the standoff, said threaded member having a central through opening and an external threading, and

   a second threaded member having an internal threading and threadably received on the external threading of the first threaded member;
   b) mounting the handle assembly on a pivot rod of a damper plate arranged in a section of ductwork so that the pivot rod is received in the through opening of the first threaded member; and
   c) engaging a third threaded member on a threaded end of the pivot rod, wherein no fastening means are provided between at a side of contact between the standoff and the surface of the section of ductwork.

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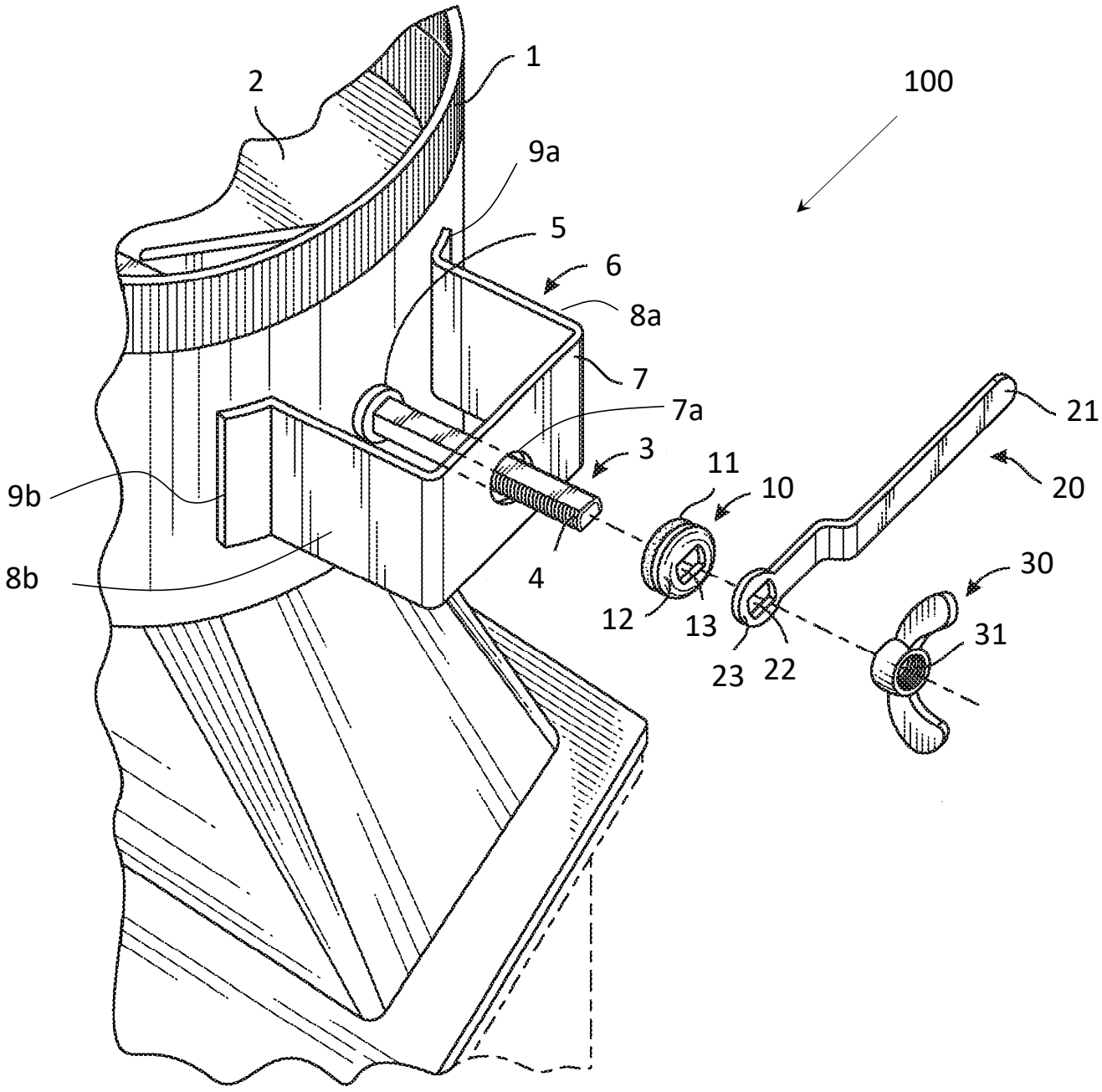

FIG. 1

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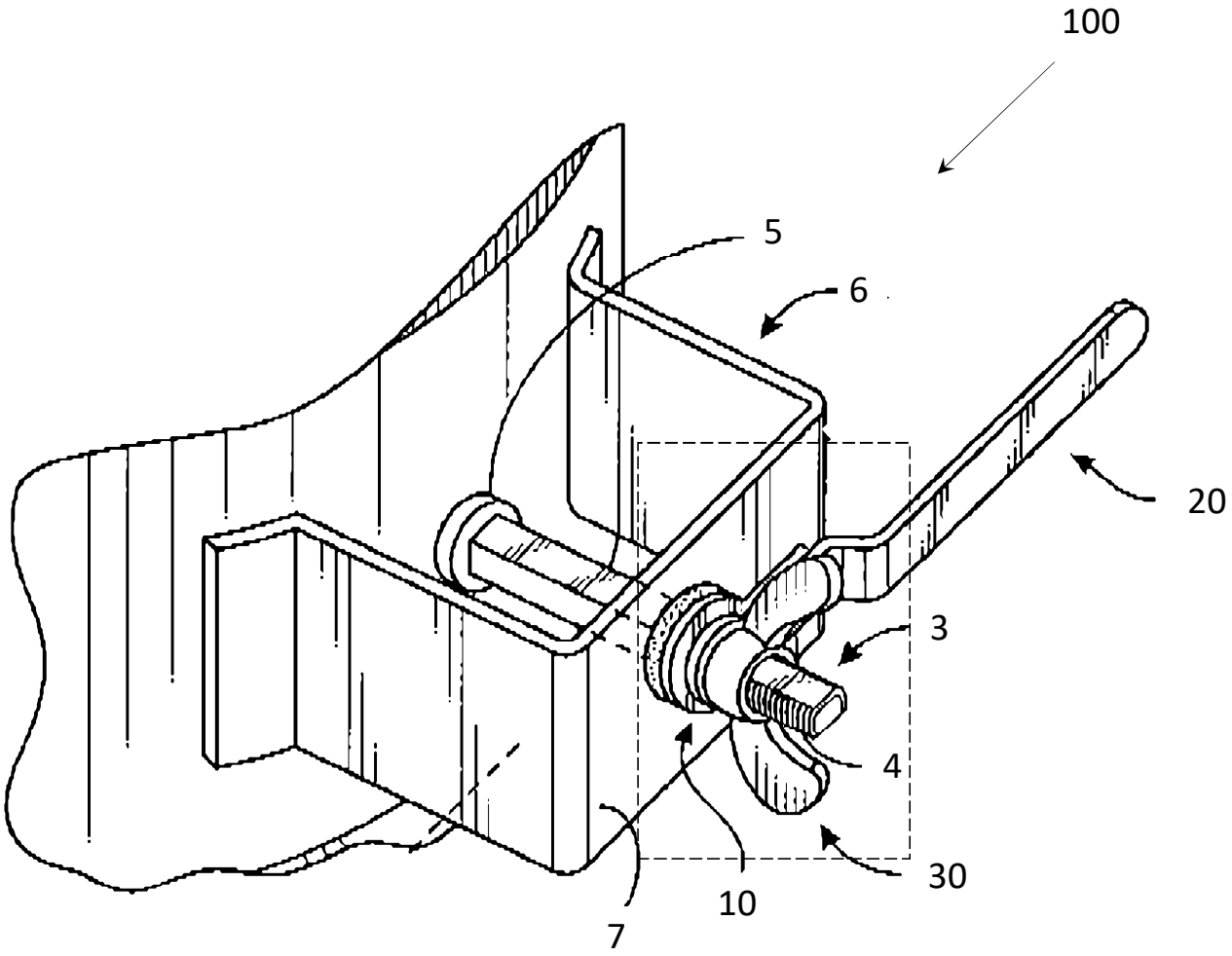

FIG. 2

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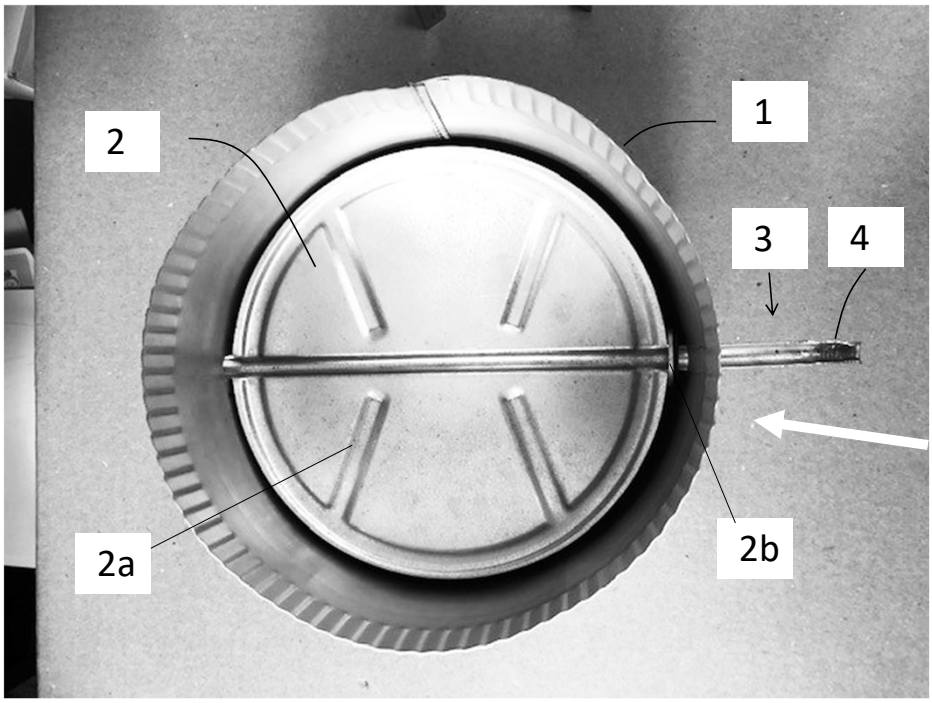

FIG. 3

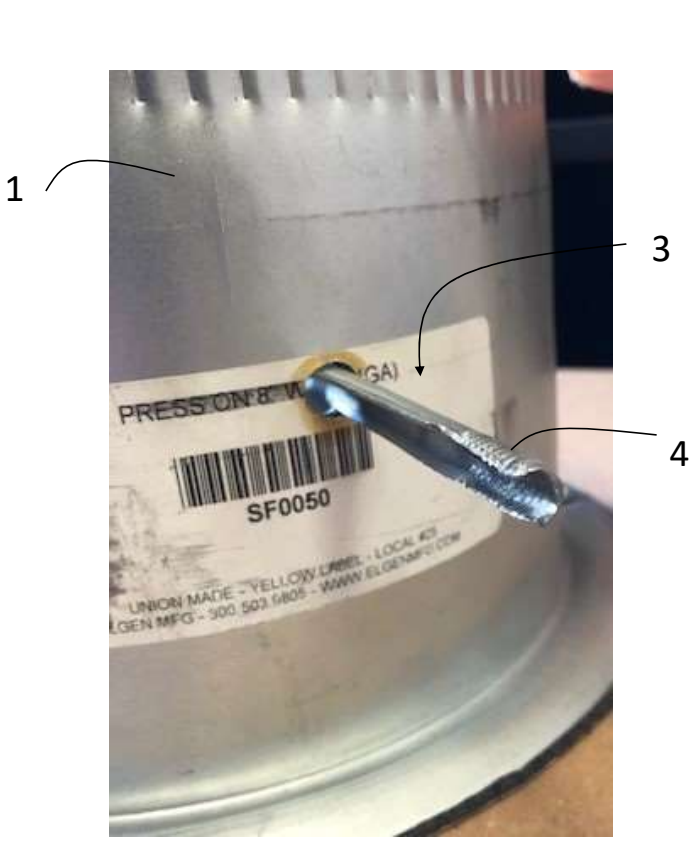

FIG. 4

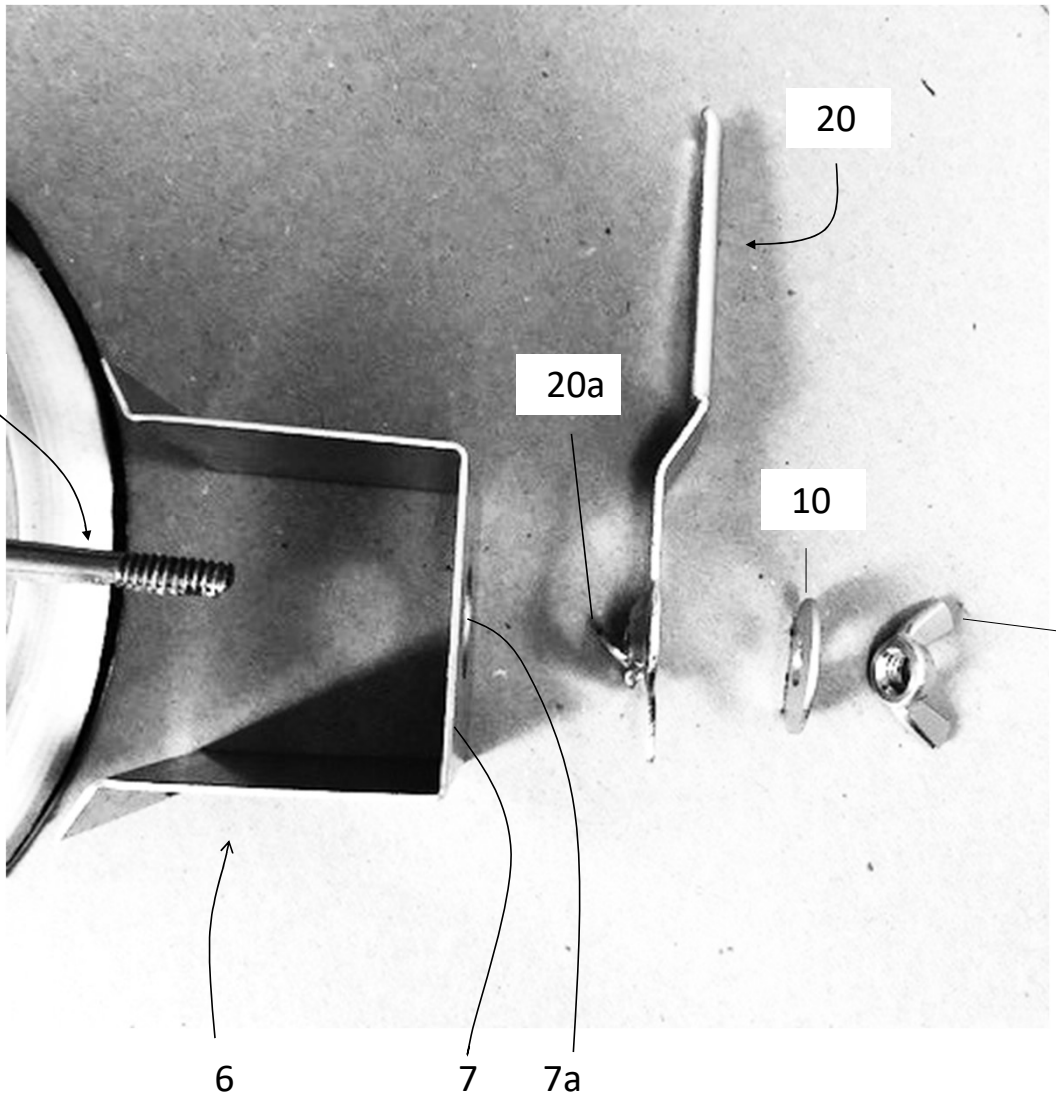

FIG. 5

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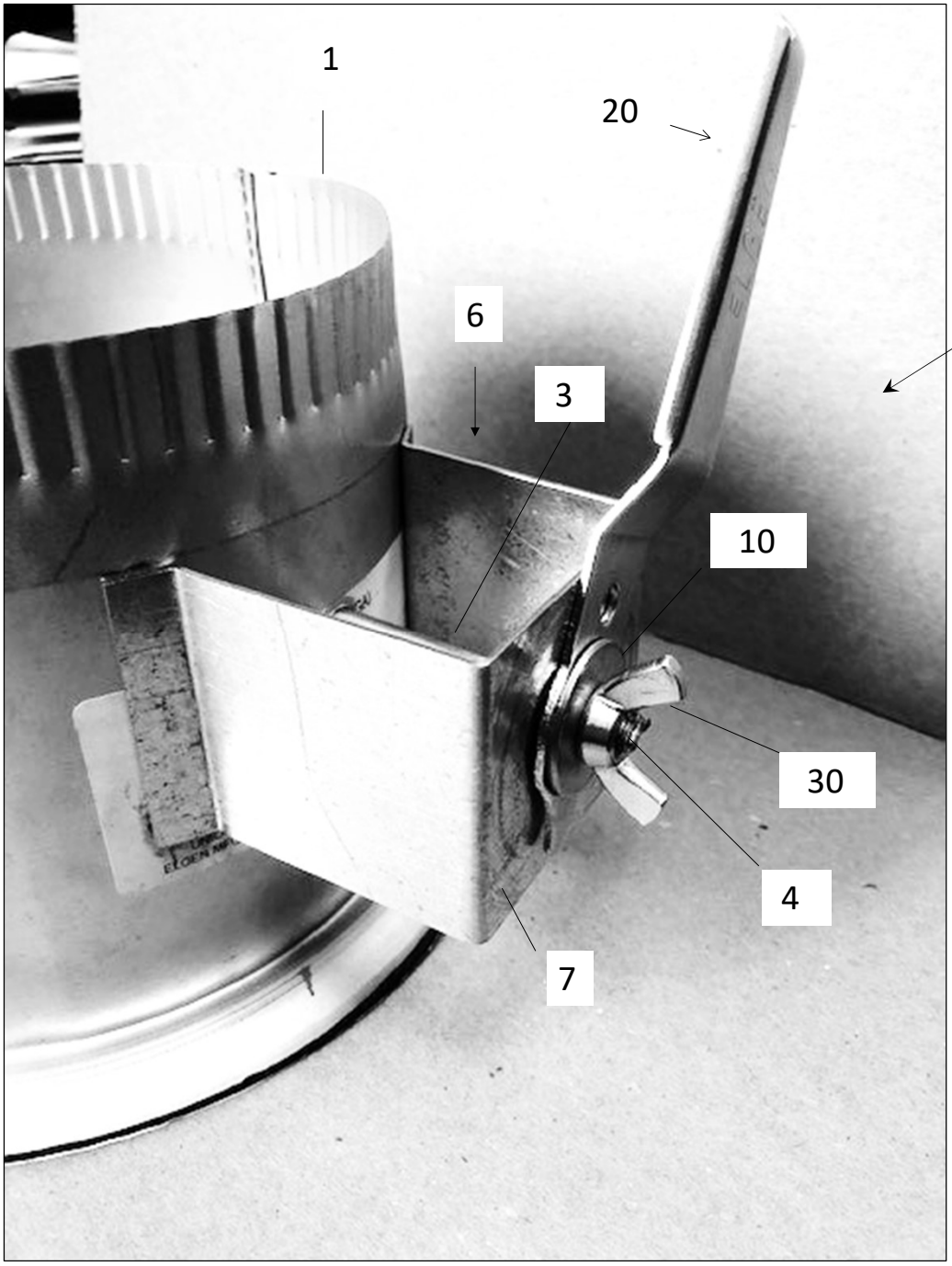

FIG. 6

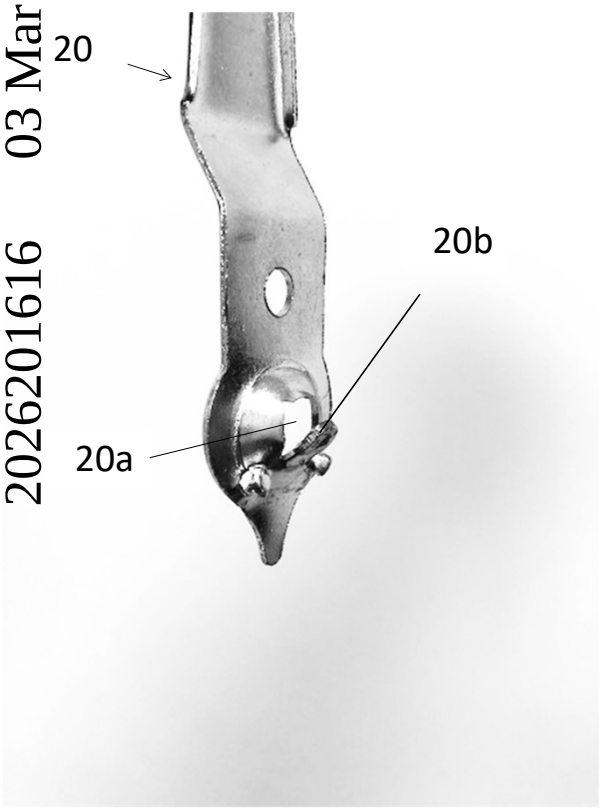

FIG. 7

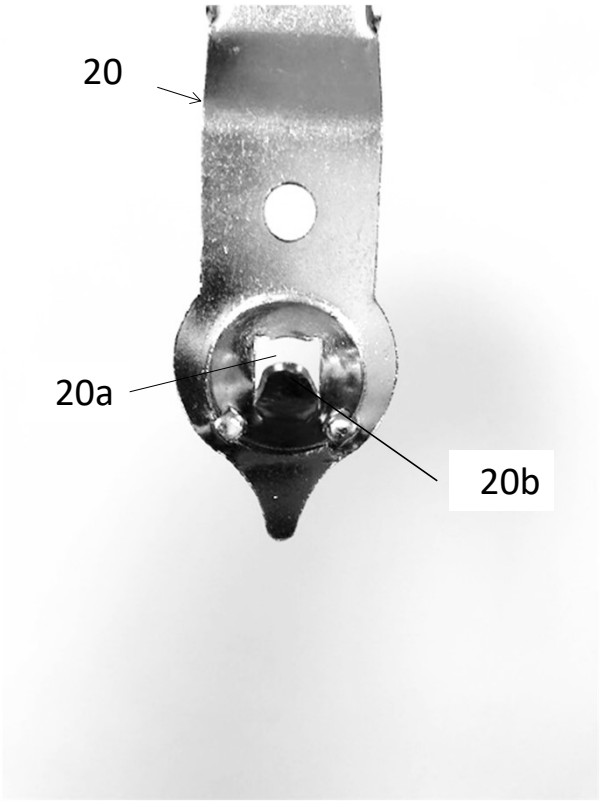

FIG. 8

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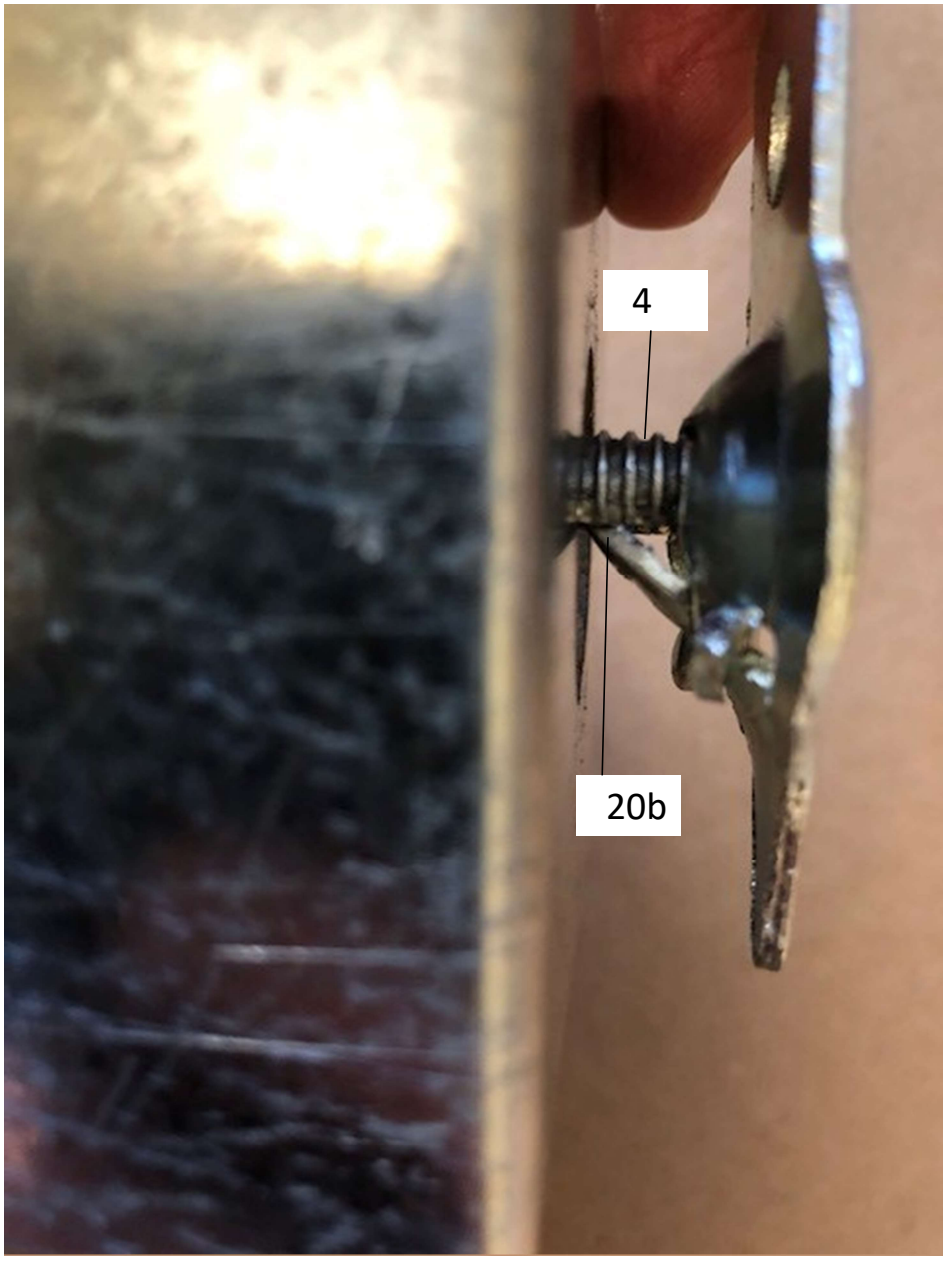

FIG. 9

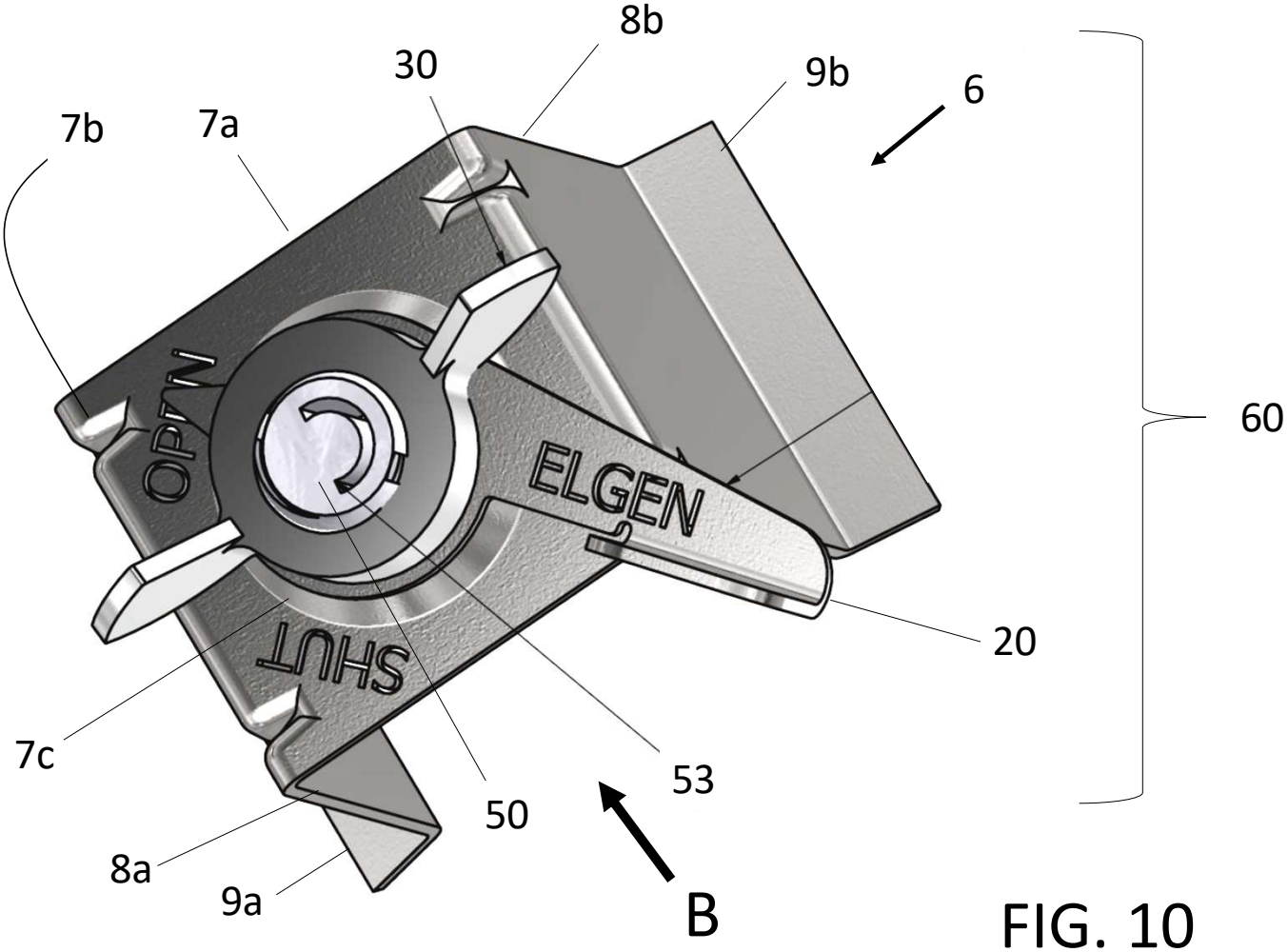

FIG. 10

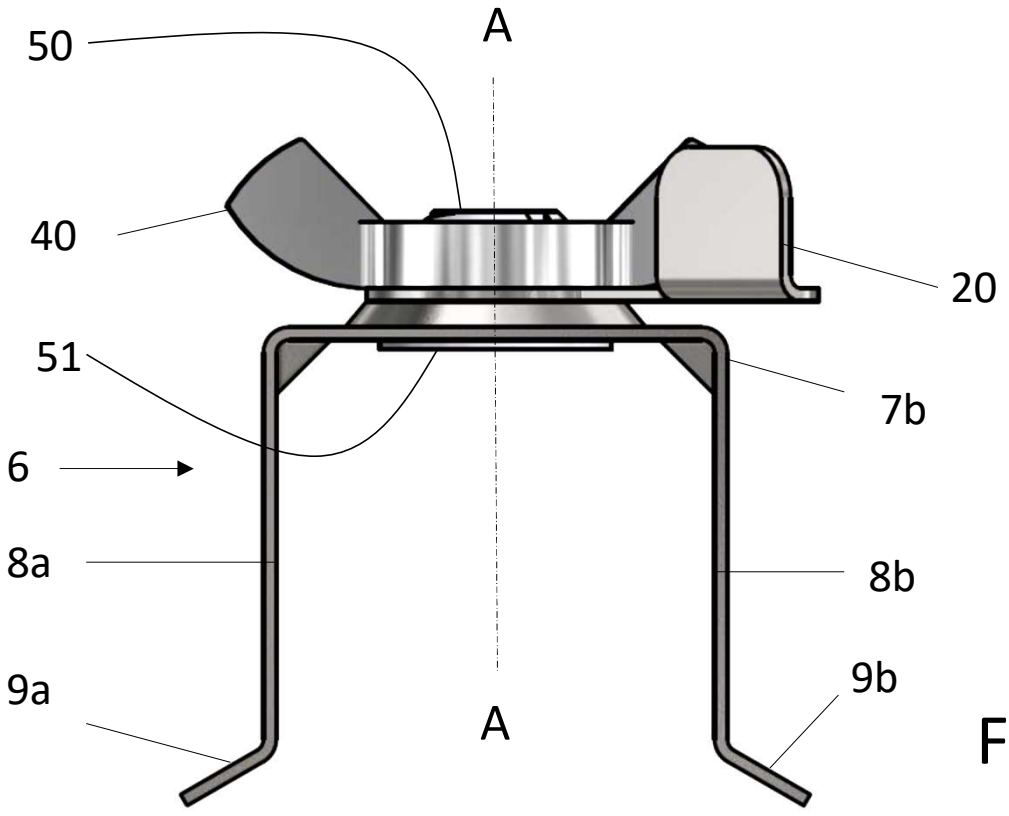

FIG. 11

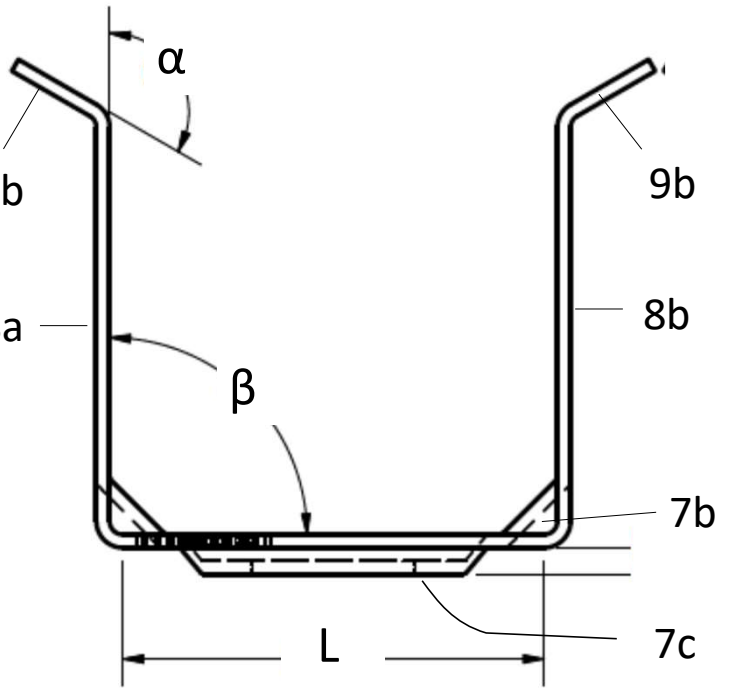

FIG. 12

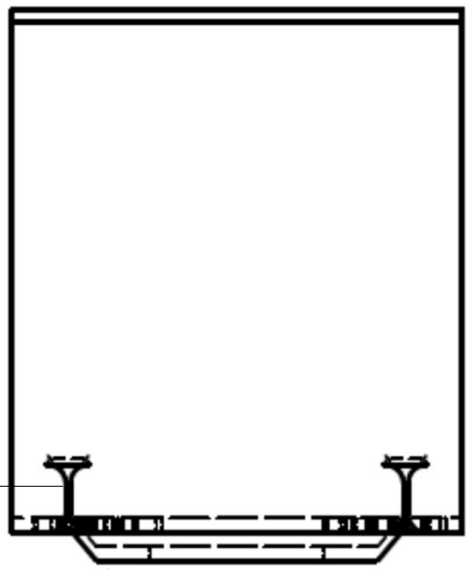

FIG. 13

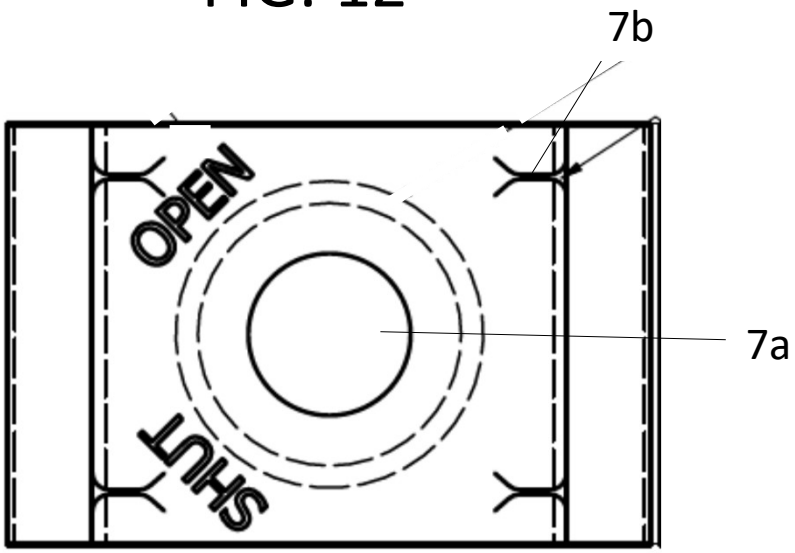

FIG. 14

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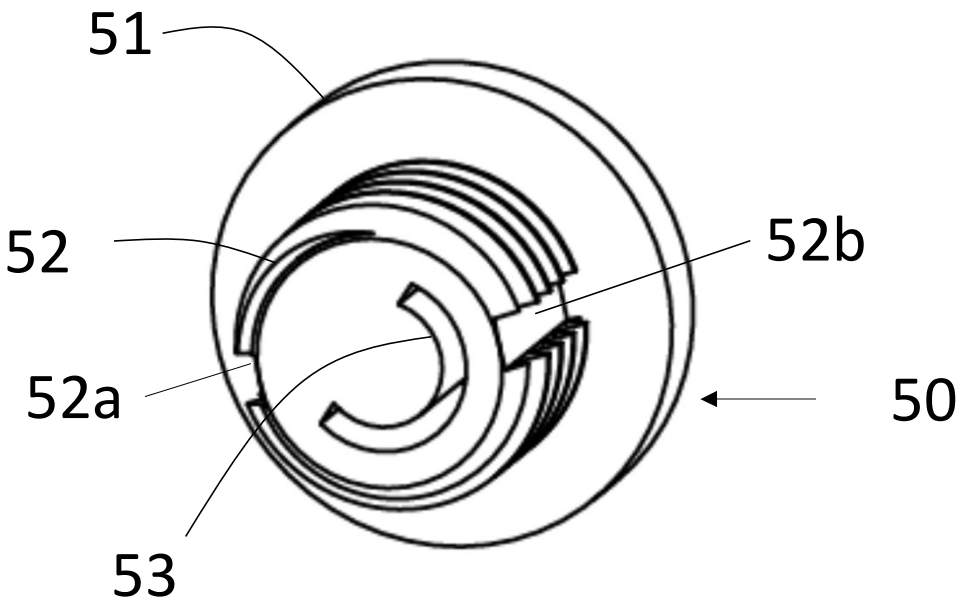

FIG. 15

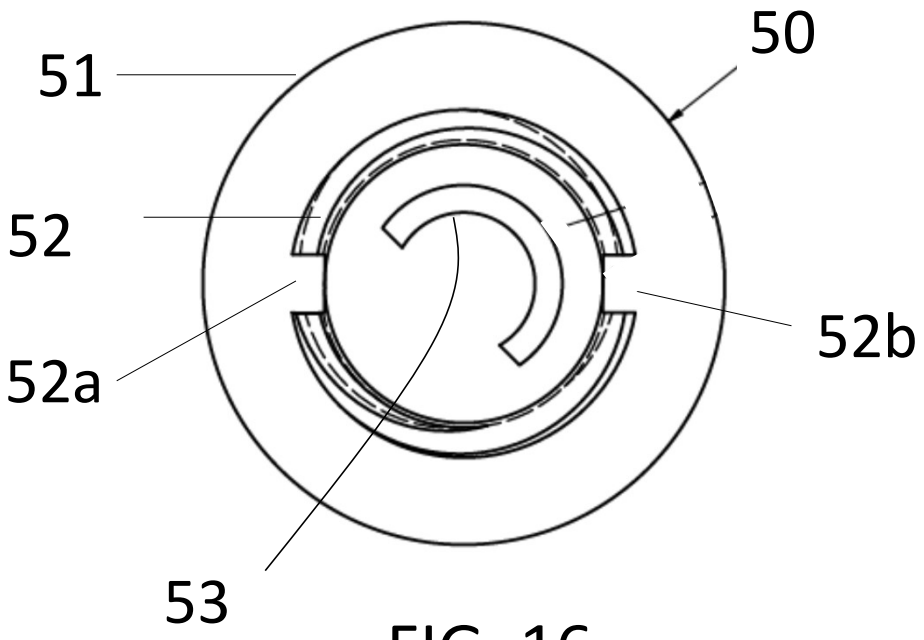

FIG. 16

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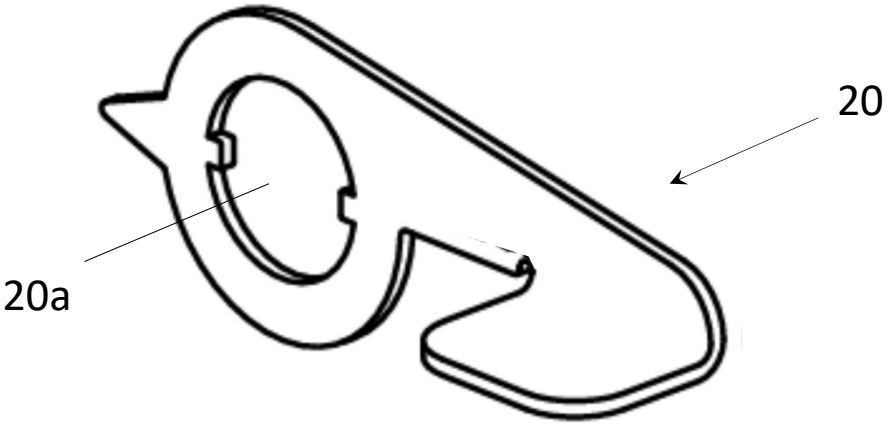

FIG. 17

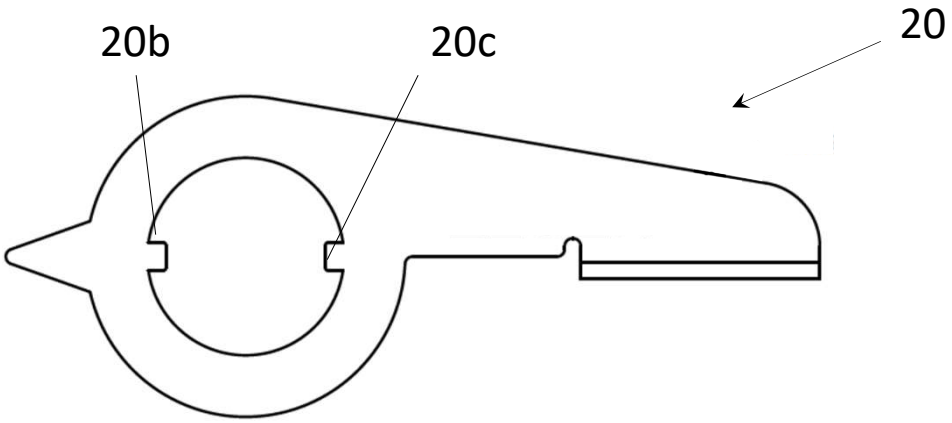

FIG. 18

03 Mar 2026
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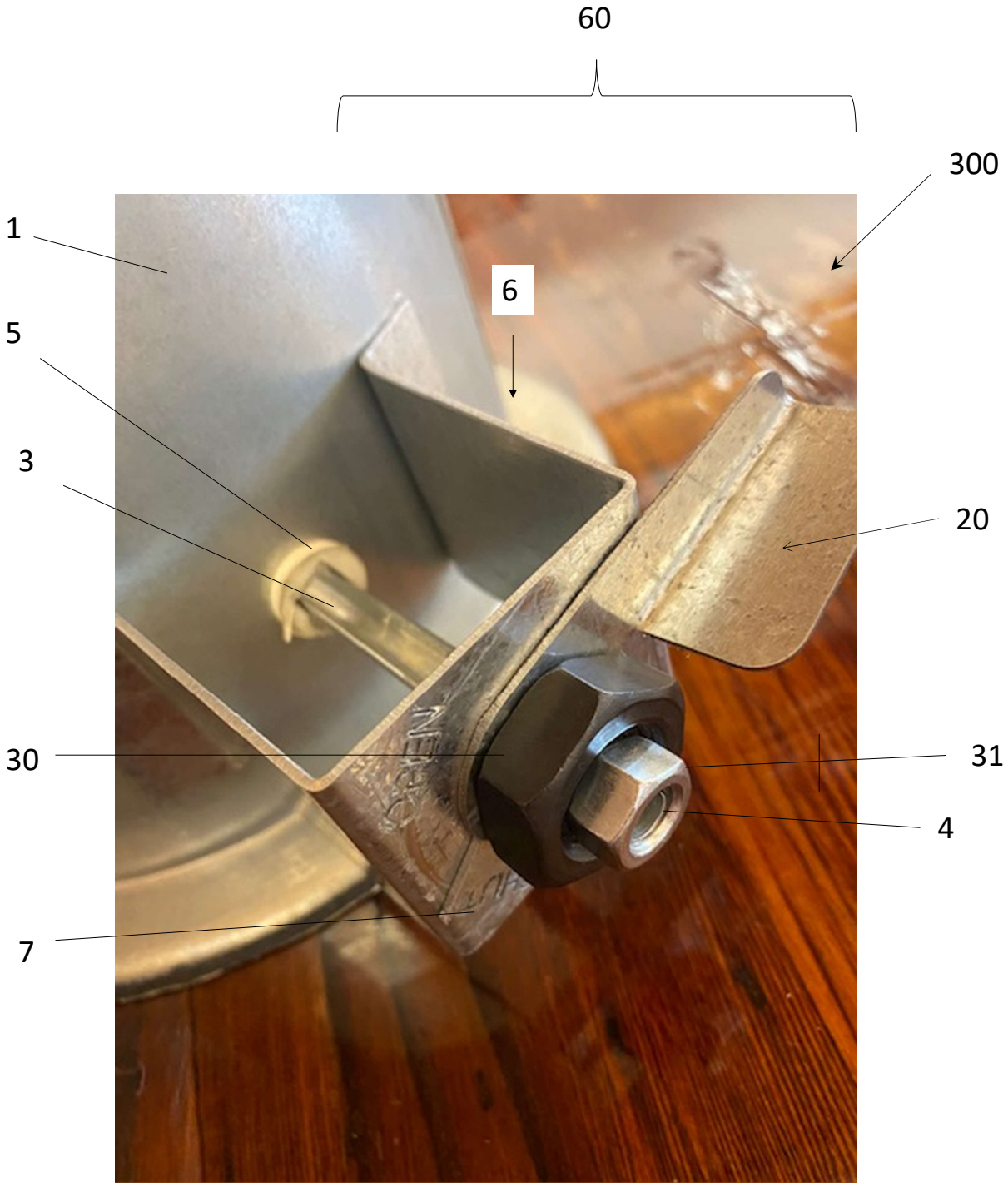

FIG. 19

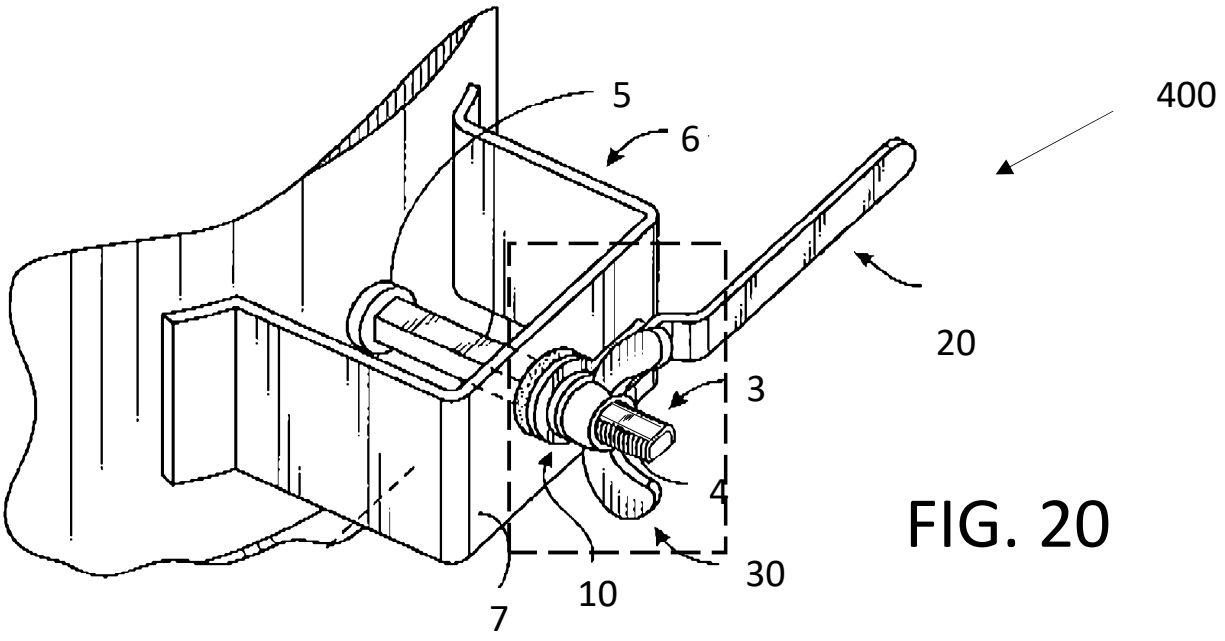

FIG. 20

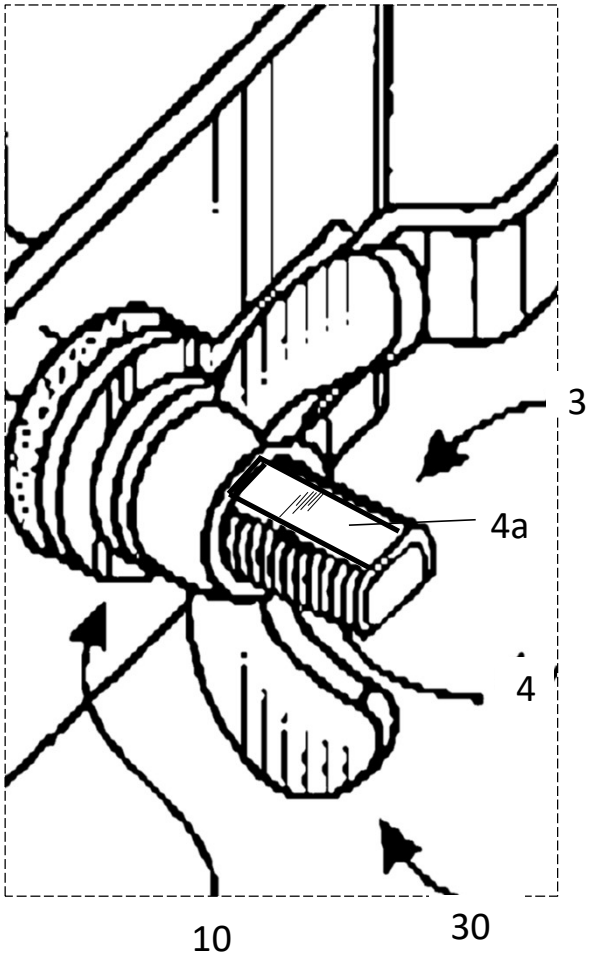

FIG. 21

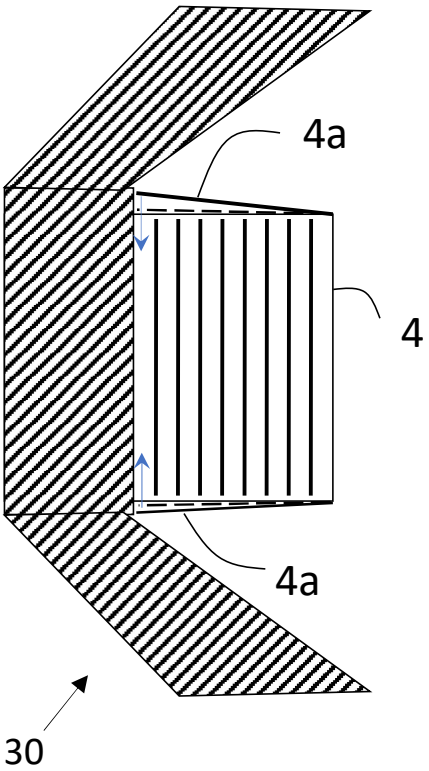

FIG. 22

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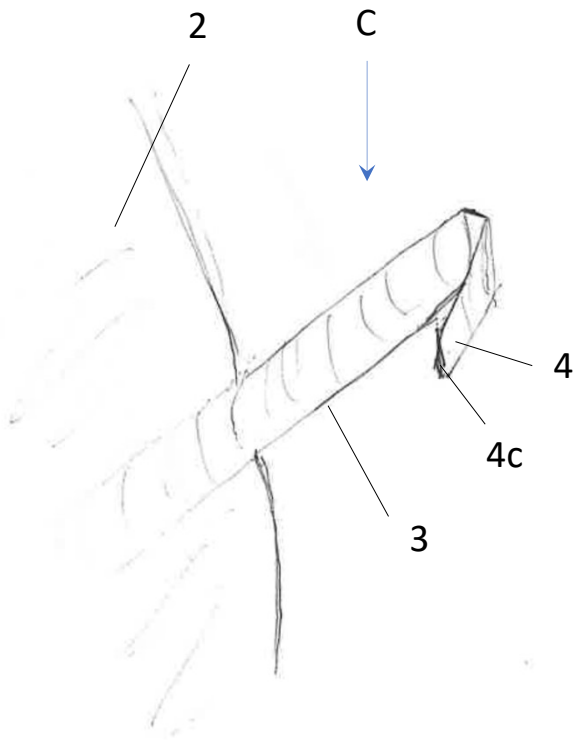

FIG. 23

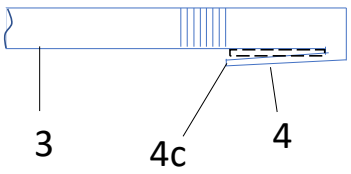

FIG. 24

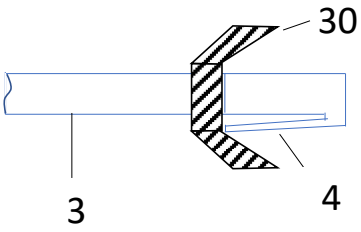

FIG. 25