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(54) **BARREL MIXER**

(57) A barrel mixer (10) is disclosed. The barrel mixer (10) comprises a barrel (12); a frame (14) for removably supporting the barrel (12), the frame (14) having a handle portion (16) and a base (18); a pivot member (20) pivotably coupled to the base (18) for movement of the barrel (12) between a mixing position and a pouring position about a rotation axis (B) relative to the pivot member (20),

the pivot member (20) having a pivot mounting element (22); and a stand (24) for supporting the frame (14), the stand (24) having a stand mounting element (26) for detachable coupling with the pivot mounting element (22), characterised by the rotation axis (B) being spaced from the pivot mounting element (22).

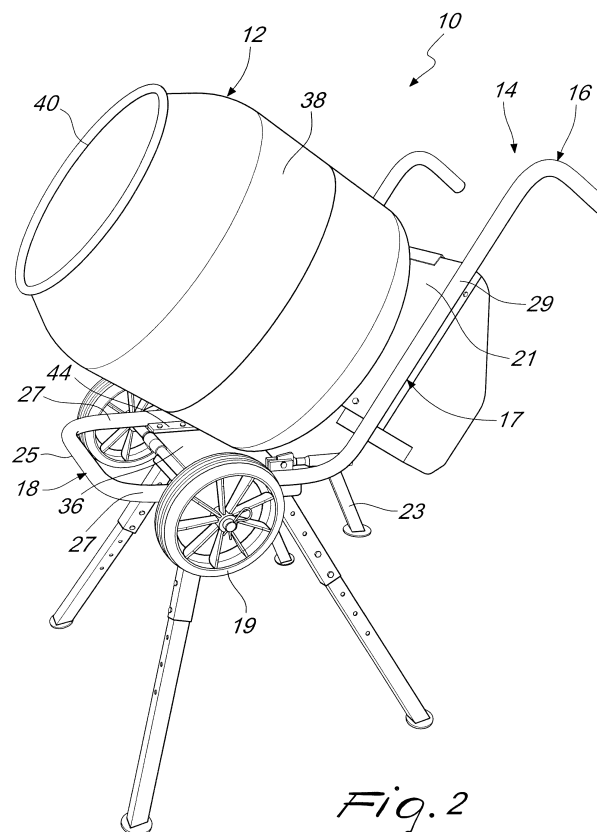


Fig. 2

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Description

Technical Field

[0001] This disclosure relates to the field barrel mixers for mixing cement, and in particular to mountable barrel mixers and more particularly to tiltable barrel mixers.

Background

[0002] Barrel mixers are used to mix materials such as cement, concrete, mortar, render and other similar materials. Barrel mixers may be used either in producing batches of mixed material or in producing continuous amounts of mixed material.

[0003] Barrel mixers may have different types. One type of a barrel mixer is mounted so as to be tiltable between a mixing position and a tipping position. The barrel mixer can have an ability for the tilt angle to be fixed at a position between the mixing and tipping positions.

[0004] Barrel mixers may have a support base on which it is tiltable. The support base may have wheels for ease of movement of the barrel mixer. The barrel mixer may be attached to the base which prevents dismantling into component parts. The barrel mixer may be detachable from the support base which allows for dismantling into component parts for easy transportation.

[0005] EP1332853 discloses a barrel mixer comprising a support for a rotary mixer barrel having a tipping arrangement. The barrel mixer can be tilted between a mixing position in which the barrel is angled so as to retain its contents and a pouring position in which the barrel is angled so that its contents are poured out. The tipping arrangement has a first and second limiting stops that are provided to limit the movement of the barrel between the mixing and pouring positions.

[0006] The barrel mixer also has a motor and transmission mounted on the support for rotating the barrel, and includes a step-down gearing positioned between the motor and the barrel. The motor and the associated gearing can be tilted along with the barrel.

[0007] The support comprises a wheeled trolley and a stand with a pintle bearing that can receive the wheeled trolley. The pintle bearing permits the support to be tipped on the pintle bearing between the mixing position and the pouring position.

[0008] The present disclosure is directed, at least in part, to improving or overcoming one or more aspects of the prior art system.

Brief Summary of the Invention

[0009] In a first aspect, the present disclosure describes a barrel mixer comprising: a barrel; a frame for removably supporting the barrel, the frame having a handle portion and a base; a pivot member pivotably coupled to the base for movement of the barrel between a mixing position and a pouring position about a rotation axis rel-

ative to the pivot member, the pivot member having a pivot mounting element; and a stand for supporting the frame, the stand having a stand mounting element (26) for detachable coupling with the pivot mounting element, characterised by the rotation axis (B) being spaced from the pivot mounting element.

[0010] In a second aspect, the present disclosure describes a method.

10 Brief Description of the Drawings

[0011] The foregoing and other features and advantages of the present disclosure will be more fully understood from the following description of various embodiments, when read together with the accompanying drawings, in which:

Fig. 1 is a front view of a barrel mixer according to the present disclosure;

Fig. 2 is a isometric view of the barrel mixer of Fig. 1;

Fig. 3 is a side view of a frame supporting a rotary mixer barrel of the barrel mixer of Fig. 1;

Fig. 4 is a plane view of a frame supporting a rotary mixer barrel of the barrel mixer of Fig. 1;

Fig. 5 is a cross-sectional view of a pivot member coupled to a wheel assembly of the barrel mixer of Fig. 1;

Fig. 6 is a side view of a stand of the barrel mixer of Fig. 1;

Fig. 7 is a plan view of a stand of the barrel mixer of Fig. 1;

Fig. 8 is a side view of the barrel mixer at a mixing position (solid lines) and at a pouring position (dashes);

Fig. 9 is a front view of the barrel mixer in a pouring position with the base positioned away from the pivot member;

Fig. 10 is a schematic view of a motor and a transmission system to rotate the barrel of the barrel mixer; and

Fig. 11 is a side view of a casing for the motor and transmission system of Fig. 9.

Detailed Description

[0012] This disclosure generally relates to a barrel mixer **10**. The barrel mixer **10** may be adjusted so as to be inclined between a mixing position and a pouring position.

[0013] Fig. 1 illustrates a barrel mixer **10**. The barrel mixer **10** comprises a barrel **12**. Barrel **12** may have a body **38** and a mouth **40**. Body **38** is cylindrical. Mouth **40** is positioned at an end of the body **38**. Mouth **40** is open for receiving component materials and for permitting mixed materials to be poured out. Mouth **40** has a diameter that is smaller than the diameter of the body **38**. Barrel **12** may be a rotary mixer barrel that is driven by a motor (not shown).

[0014] With respect to figure 2, the barrel mixer **10** comprises a frame **14**. The barrel **12** is removably supported on the frame **14**. The barrel **12** may be mounted onto the frame **14** for operation and demounted for transportation. Barrel **12** may be rotatably supported on the frame **14**. With respect to fig. 3, barrel **12** may be rotatably supported on the frame **14** so as to rotate about a rotary mixing axis **A**. The barrel **12** may be rotated manually or by a motor.

[0015] With respect to figs. 2 and 3, the frame **14** has a handle portion **16** and a base **18**. Handle portion **16** may have handles **15** for manual control of the barrel mixer **10**. Base **18** may be provided with wheels **19** and frame legs **23**. Frame legs **23** may be spaced from the wheels **19**. Opposite sides of the base **18** is provided with a respective wheel **19** and a frame leg **23**. Frame **14** may be in a form of a trolley.

[0016] Frame **14** has a body portion **17** positioned between the handle portion **16** and the base **18**. Body portion **17** is inclined relative to the base **18**. Body portion **17** is inclined away from the base **18**. Base **18** may be U shaped. In an embodiment, base **18** may be formed from a single tube formed into a U shaped structure. Base **18** comprises a beam **25** and arms **27**. The beam **25** connects to ends of the arms **27**. At respective opposite ends, each arm **27** is connected to the body portion **17**. In an embodiment, body portion **17** comprises spaced apart tubes **29**. Each spaced apart tube **29** of the body portion **17** is connected to a respective arm **27** of base **18**.

[0017] With respect to fig. 3, handle portion **16** may be comprised of tubes wherein each tube has a handle **15** and a connection end **31**. The handle portion **16** may be substantially L-shaped wherein the handles **15** are substantially perpendicular to the connection ends **31**. Connection ends **31** are mounted to the body portion **17**. Connection ends **31** are mounted to the body portion **17** at a plurality of engagement points on the body portion **17**. The distance of the handles **15** from the body portion **17** may be varied by the selection of a suitable engagement point thereon. Connection ends **31** are linearly aligned with the body portion **17**. Handles **15** are inclined relative to the body portion **17**. In an embodiment, handles **15** are substantially perpendicular to the body portion **17**.

[0018] Barrel **12** is removably mounted to the frame **14** at the body portion **17**. Barrel **12** is positioned at the body portion **17** so as to be suspended over the base **18**. End of body **38** opposite mouth **40** is coupled to the body portion **17**. Mouth **40** is located over the base **18**. Position of barrel **12** is fixed relative to the base **18**.

[0019] Rotation axis **A** of barrel **12** is substantially perpendicular to the body portion **17**. Rotation axis **A** of barrel **12** is inclined relative to the base **18**. Rotation axis **A** of barrel **12** is inclined away from the base **18**. Position and angle of inclination of rotation axis **A** is fixed relative to the base **18**.

[0020] With reference to fig. 2, body portion **17** has a panel **21** for removable mounting of the barrel **12**. In an embodiment, panel **21** is positioned between the tubes

29 forming the body portion **17**. Panel **21** may be positioned between the barrel **12** and the transmission system (not shown). The transmission system and the motor may be encompassed within a cover **42**.

[0021] With respect to figs. 4 and 5, barrel mixer **10** has a pivot member **20**. The pivot member **20** is pivotably coupled to the base **18**. Pivot member **20** is pivotably coupled to the base **18** so as to enable the movement of the barrel **12** between a mixing position and a pouring position relative to the pivot member **20**. The barrel **12** undergoes a rotational movement between the mixing position and the pouring position relative to the pivot member **20**. Barrel **12** moves along an arc when travelling between the mixing position and the pouring position relative to the pivot member **20**.

[0022] Barrel **12** is movable about the rotation axis **B**. Barrel **12** is movable about the rotation axis **B** when travelling between the mixing position and the pouring position. The rotation axis **B** is perpendicular to the rotary mixing axis **A**. Rotation axis **B** is positioned transverse to the plane of movement of the barrel **12**.

[0023] Barrel mixer **10** comprising a hinge coupling **28** between the pivot member **20** and the base **18**. The rotation axis **B** extends through the hinge coupling **28**. Barrel **12** is rotatable along the direction in which the pivot member **20** is rotatable. Rotation of pivot member **20** relative to the base **18** enables the movement of the barrel **12** between the mixing position and the pouring position.

[0024] In an embodiment, the hinge coupling **28** comprises a strut **32**. The base **18** has the strut **32** extending transversely across. Strut **32** is rigidly fixed to the base **18**. Pivot member **20** is pivotably coupled to the strut **32**. Pivot member **20** is rotatable about strut **32**. Rotation axis **B** may extend through the strut **32**. In an embodiment, strut **32** extends between arms **27**. Strut **32** is perpendicular to the arms **27**. Pivot member **20** is rotatable between the arms **27**. Strut **32** is spaced from beam **25**. Strut **32** is parallel to the beam **25**. Strut **32** is positioned between the frame legs **23** and the beam **25**. Pivot member **20** is within the space provided between the arms **27** and the beam **25**.

[0025] Hinge coupling **28** comprises at least one ring **34** rotatably coupled to the strut **32** and rigidly fixed to the pivot member **20**. Ring **34** is positioned on an edge of the pivot member **20**. The pivot member **20** comprises at least two rings **34** rotatably connected to the strut **32**.

[0026] With reference to Fig. 5, the pivot member **20** comprises a pivot plate **30**. The pivot plate **30** is pivotably coupled to the base **18**. The pivot plate **30** is pivotable about the rotation axis **B**. The edge of pivot plate **30** is pivotably coupled to the base **18** through the hinge coupling **28**. The ring **34** is disposed on the edge of plate **30** for rotatable coupling to the strut **32**. In an embodiment, pivot plate **30** is rectangular in shape. Pivot plate **30** is substantially flat.

[0027] In an embodiment, hinge coupling **28** may comprise protrusions from the arms **27** to which the pivot

member **20** is coupled. Protrusions may be in mutual alignment on the arms **27**. Rotation axis **B** may extend through the protrusions.

[0028] With reference to Fig. 4, in an embodiment, the strut **32** extends away from base **18** so as to present free ends on either side of the base **18** for attachment of wheels **19**. The strut **32** serves as the axle for the wheeled frame **14**. The rotation axis **B** extends through the wheels **19**.

[0029] With reference to Figs. 4, 5 and 9, barrel mixer **10** further comprises a limit plate **36** rigidly fixed to the base **18** for limiting the movement of the pivot member **20**. Limit plate **36** limits the rotational movement of the base **18** relative to the pivot member **20**. Limit plate **36** limits the rotational movement of the base **18** relative to the pivot member **20** towards the barrel **12**. Limit plate **36** abuts the pivot member **20** thereby preventing further rotational movement of the base **18**.

[0030] Limit plate **36** is configured to abut and rest against the pivot plate **30**. Limit plate **36** abuts the pivot plate **30** at respective planar sides. Limit plate **36** has a limit surface **46** that abuts an abutment surface **48** of the pivot plate **30**.

[0031] Limit plate **36** is positioned on a plane that is substantially parallel to the plane of the base **18**. Limit plate **36** is positioned on a plane that is substantially aligned to the rotational axis **B**. Limit plate **36** is positioned between the arms **27**. Limit plate **36** is rigidly connected to the arms **27**. Limit plate **36** is connected at respective opposite sides to brackets **44** that are rigidly joined to the arms **27**. Limit plate **36** is spaced from the beam **29**. Limit plate **36** is positioned adjacent strut **32**.

[0032] In an embodiment, limit plate **36** is rigidly connected to the strut **32**. Limit plate **36** is rigidly connected to the strut **32** along a side that is adjacent to the sides connected to the arms **27**. Connections of the limit plate **36** to the strut **32** are positioned between the respective arms **27** and the hinge connection **28** of the pivot member **20** and the strut **32**.

[0033] In an embodiment, limit plate **36** has a rectangular shape. Limit plate **36** has a dimension that is greater than the dimension of the pivot member **20**. Limit plate **36** has a dimension that is greater than the dimension of the pivot plate **30**.

[0034] With reference to fig. 4, the pivot member **20** further comprises a pivot mounting element **22**. The rotation axis **B** is spaced from the pivot mounting element **22**. The pivot mounting element **22** is disposed away from the rotation axis **B**. The pivot mounting element **22** is positioned away from the hinge coupling **28**. The pivot mounting element **22** is positioned away from the strut **32**.

[0035] Pivot mounting element **22** is disposed on a resting surface **52** that is the side opposite the abutment surface **48**. The pivot mounting element **22** is a projection centrally positioned on the pivot plate **30**. Pivot mounting element **22** extends from the pivot plate **30** away from the resting surface **52**. Pivot mounting element **22** is circled by positional ring **50**. Positional ring **50** extends from

the abutment surface **48**. Positional ring **50** extends in a direction parallel to the pivot mounting element **22**. Pivot mounting element **22** extends to greater length from the pivot plate **30** relative to the positional ring **50**.

[0036] In an embodiment, pivot mounting element **22** is a tube extending from the pivot plate **30**. Pivot mounting element **22** is perpendicular to the pivot plate **30**. Pivot mounting element **22** is perpendicular to the rotation axis **B**.

[0037] With reference to figs. 6 and 7, barrel mixer **10** further comprises a stand **24** for supporting the frame **14**. The stand **24** has a stand mounting element **26** for detachable coupling with the pivot mounting element **22**. Stand **24** further comprises a platform **54** having the stand mounting element **26**. Platform **54** engages the pivot member **20**. The pivot member **20** rests on the platform **54** when the frame **14** is mounted on the stand **24**. Pivot plate **30** is supported by the platform **54**. Platform **54** has a support surface **56** for engaging the resting surface **52** of the pivot plate **30**. Platform **54** is substantially flat.

[0038] Stand mounting element **26** is positioned in the centre of the platform **54**. Stand mounting element **26** is a projection centrally positioned on the pivot plate **30**. Stand mounting element **26** extends from the platform **54** away from the support surface **56**. Pivot mounting element **22** engages with the stand mounting element **26**. Pivot mounting element **22** is insertable into the stand mounting element **26**.

[0039] In an embodiment, stand mounting element **26** is a tube extending from the platform **54**. Stand mounting element **26** is perpendicular to the platform **54**. Stand mounting element **26** is perpendicular to the rotation axis **B**.

[0040] Stand mounting element **26** is circled by positional depression **58**. Positional depression **58** is formed on the platform **54** and positioned opposite the support surface **56**. Positional depression **58** is coaxially positioned relative to the stand mounting element **26**. Positional ring **50** engages with the positional depression **58**. Positional ring **50** engages into the positional depression **58**.

[0041] Stand **24** further comprises stand legs **59**. Stand legs **59** are connected to the platform **54**. Stand legs **59** are connected to the platform **54** opposite the support surface **56**. Stand legs **59** are connected to the platform **54** at the corners thereof. Stand legs **59** are inclined relative to the platform **54**. Stand legs **59** are inclined away from the stand mounting element **26**.

[0042] With reference to Fig. 8, the barrel **12** is shown in a mixing position represented with solid lines and in a pouring position represented with dashes. In the pouring position, the barrel **12**, frame **14** motor and transmission system enclosed in cover **42** are tilted relative to the stand **24**. With reference to Fig. 9, at the pouring position the limit plate **36** is rotated away from the pivot member **20**. Pivot plate **30** remains in contact with the stand **24**.

[0043] With reference to Fig. 10, the barrel mixer **10**

further comprises a motor **60** and transmission system **62** for rotating the barrel **12**. The transmission system **62** is interposed between the motor **60** and the barrel **12**. The transmission system **62** and the motor **60** are positioned on panel **21**. The transmission system **62** and the motor **60** are positioned on the side of panel **21** opposite to the side supporting the barrel **12**. The transmission system **62** and the motor **60** are demountable from the panel **21**. The demounted transmission system **62** and the motor **60** can be positioned within the barrel **12** for ease of transportation of the barrel mixer **10**.

[0044] Transmission system **62** comprises a pulley **64**, a first gear **66** and a second gear **68**. The first gear **66** may be a pinion and the second gear **68** may be a chain transmission gear ring. Motor **60** may be coaxially aligned to the second gear **68**.

[0045] Motor **60** is coupled to the pulley **64**. Pulley **64** is driven by the motor **60** via a belt **76**. Pulley **64** receives the rotation and force from the motor **60** through the belt **76**. This makes possible the easy adjustment of belt **76**. The belt **76** may be made from rubber. Vibrations produced by the motor **60** and pulley **64** may be eliminated by rubber belt damping. The force transmission that occurs between the motor **60**, that is fixed on a non-metallic support, and the pulley **64**, eliminates possible damage caused by electric shock with the transmission being made by a rubber belt.

[0046] First gear **66** is connected with the pulley **64**. First gear **66** and the pulley **64** rotatable in unison. First gear **66** and pulley **64** rotate together when the first gear **66** is driven by the motor **60** via belt **76**.

[0047] The second gear **68** is connected to the axel **72** of the barrel **12**. Rotation of the second gear **68** rotates the barrel **12**. The diameter of the second gear **68** is increased in order to ensure increased binary force on the barrel. The second gear **68** transfers force and rotation to the barrel **12**, without losses, in the cement mixing time. The diameter of the second gear **68** is greater than the diameter of the first gear **66**.

[0048] Second gear **68** is coupled to the first gear **66** by a chain **70**. The chain **70** has a tensioning member **78** that ensures the chain **70** is properly tensioned between the first gear **66** and the second gear **68** thereby avoiding losses of force and power. The first gear **66** incorporated on the pulley **64** transmits force via chain **70** to the second gear **68** that makes rotate the barrel **12**.

[0049] Second gear **68** is connected to the axel **72** so that the rotation of the second gear **68** rotates the barrel **12**. Axel **72** extends through the panel **21** so as to connect the transmission system **62** to the barrel **12**. In an embodiment, axel **72** is configured to support and rotate the barrel **12**. With reference to Fig. 11, transmission system **62** and the motor **60** may be disposed in a casing **74**.

[0050] The transmission system **62** has two transmission systems, one by chain **70** and another by belt **76**. Through this dual transmission there is an increase in performance of the barrel mixer **12** and an increase in safety during use.

[0051] The skilled person would appreciate that foregoing embodiments may be modified or combined to obtain the barrel mixer **10** of the present disclosure.

5 Industrial Applicability

[0052] This disclosure describes a barrel mixer **10** for mixing materials such as cement, concrete, mortar, render and other similar materials. Barrel mixer **10** has a stand **24** which supports the barrel **12** at a height that allows easy access to the mouth **40** of the barrel **12** and enables the barrel **12** to be moved between a mixing position and a pouring position. The rotation of the barrel **12** occurs along a hinge coupling **28** that is spaced from the mounting of the frame **14** to the stand **24**.

[0053] Accordingly, this disclosure includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the disclosure unless otherwise indicated herein.

[0054] Where technical features mentioned in any claim are followed by reference signs, the reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, neither the reference signs nor their absence have any limiting effect on the technical features as described above or on the scope of any claim elements.

[0055] One skilled in the art will realise the disclosure may be embodied in other specific forms without departing from the disclosure or essential characteristics thereof. The foregoing embodiments are therefore to be considered in all respects illustrative rather than limiting of the disclosure described herein. Scope of the invention is thus indicated by the appended claims, rather than the foregoing description, and all changes that come within the meaning and range of equivalence of the claims are therefore intended to be embraced therein.

Claims

1. A barrel mixer (10) comprising:

- a barrel (12);
- a frame (14) for removably supporting the barrel (12), the frame (14) having a handle portion (16) and a base (18);
- a pivot member (20) pivotably coupled to the base (18) for movement of the barrel (12) between a mixing position and a pouring position about a rotation axis (B) relative to the pivot member (20), the pivot member (20) having a pivot mounting element (22); and
- a stand (24) for supporting the frame (14), the stand (24) having a stand mounting element (26) for detachable coupling with the pivot mounting

element (22),

characterised by the rotation axis (B) being spaced from the pivot mounting element (22).

2. The barrel mixer (10) of claim 1 further comprising a hinge coupling (28) between the pivot member (20) and the base (18) wherein the rotation axis (B) extends through the hinge coupling (28). 5
3. The barrel mixer (10) of claims 1 or 2 wherein the frame comprises wheels (30) coupled to the base (18) through an a strut (32), the pivot member (20) being pivotably coupled to the base (18) through the strut (32) wherein the rotation axis (B) extends through the strut (32). 10
4. The barrel mixer (10) of claim 3 wherein the pivot mounting element (22) is positioned away from the strut (32). 15
5. The barrel mixer (10) of claims 3 or 4 wherein the pivot member (20) comprises rings (34) rotatably connected to the strut (32). 20
6. The barrel mixer (10) of any one of preceding claims further comprising a limit plate (36) rigidly fixed to the base (18) for limiting the movement of the pivot member (20). 25
7. The barrel mixer (10) of any one of preceding claims wherein the pivot member comprises a pivot plate (30) pivotably coupled to the base (18), the pivot plate (30) being pivotable about the rotation axis (B). 30
8. The barrel mixer (10) of claim 7 wherein the edge of the pivot plate (30) is pivotably coupled to the base (18). 35
9. The barrel mixer (10) of claim 7 or 8 wherein the pivot mounting element (22) is a projection centrally positioned on the pivot plate (30). 40
10. The barrel mixer (10) of any one of preceding claims wherein the rotation axis (B) is positioned transverse to the plane of movement of the barrel (12). 45
11. The barrel mixer (10) of any one of preceding claims further comprising a motor (60) coupled to the barrel (12) through a transmission system (62), the transmission system (62) comprising: 50
 - a pulley (64) coupled to the motor (60) through a belt (76) ;
 - a first gear (66) connected to the pulley (64); and
 - a second gear (68) coupled to the first gear (66) through a chain (70), the second gear (68) being connected to the barrel (12) wherein the barrel55

(12) is rotatable by the motor (60) through the transmission system (62).

12. The barrel mixer (10) of claim 11 wherein the belt (76) is made of rubber.
13. The barrel mixer (10) of claims 11 or 12 wherein the motor (60) is coaxially aligned to the second gear (68).

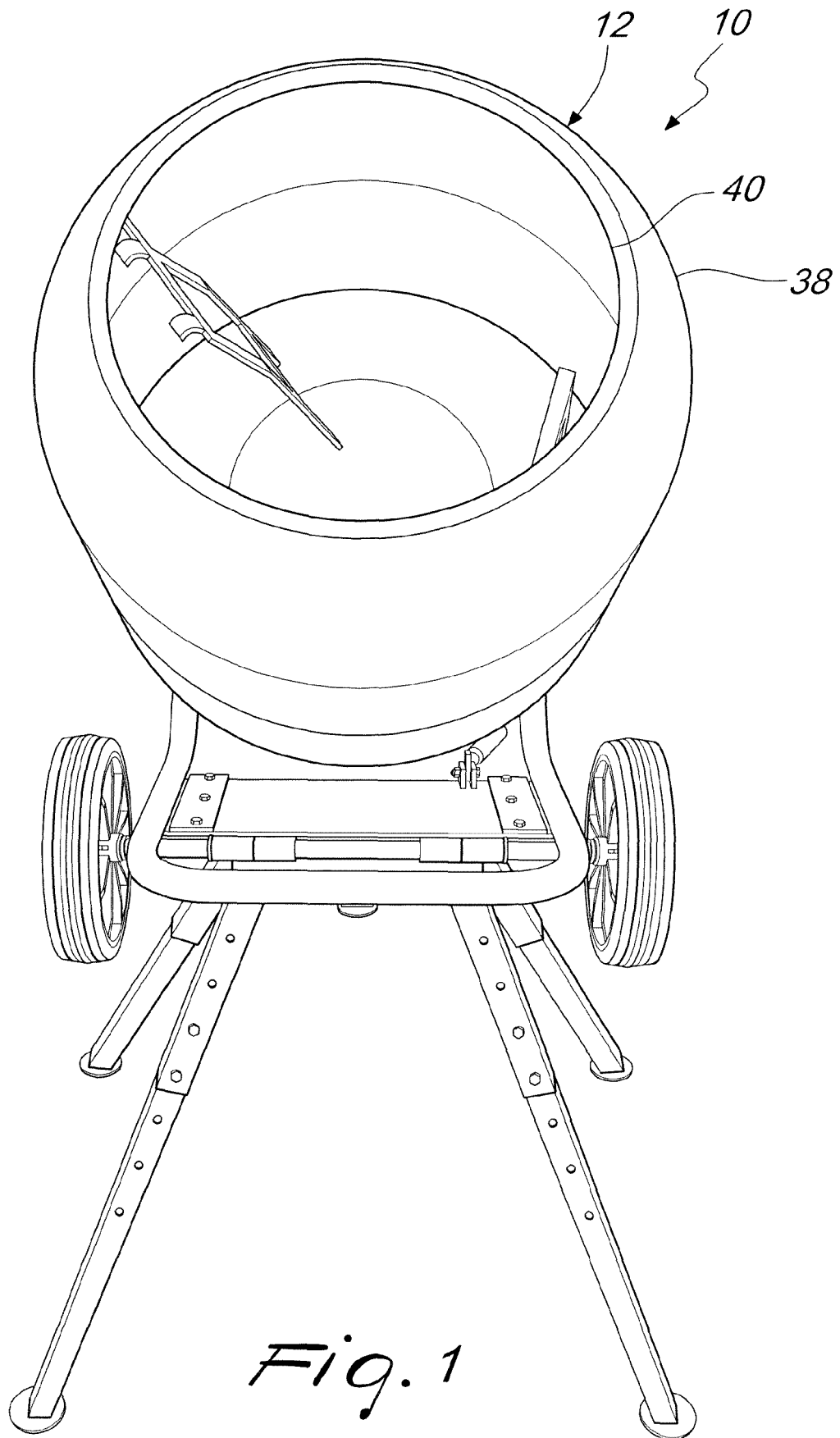


Fig. 1

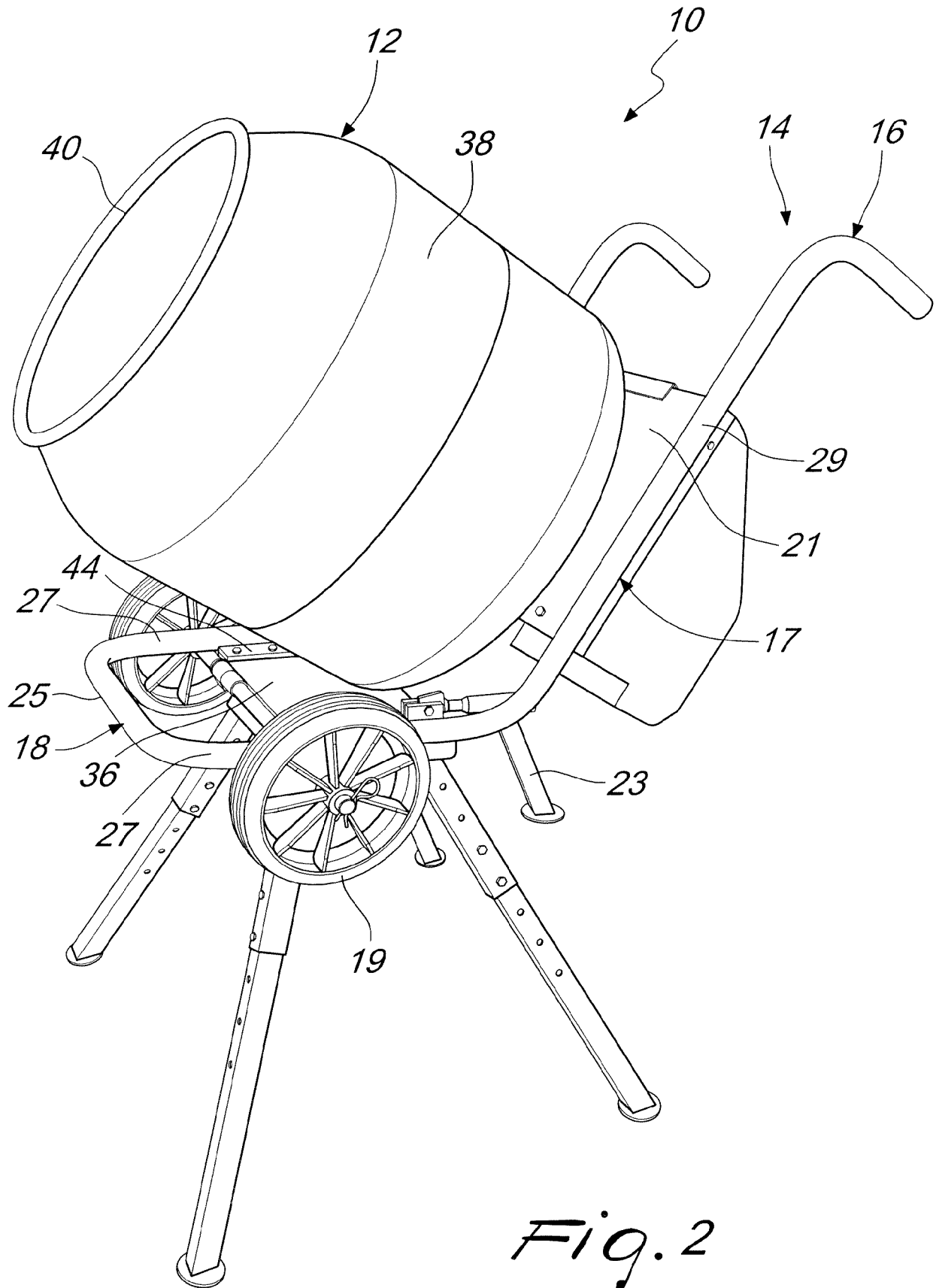


Fig. 2

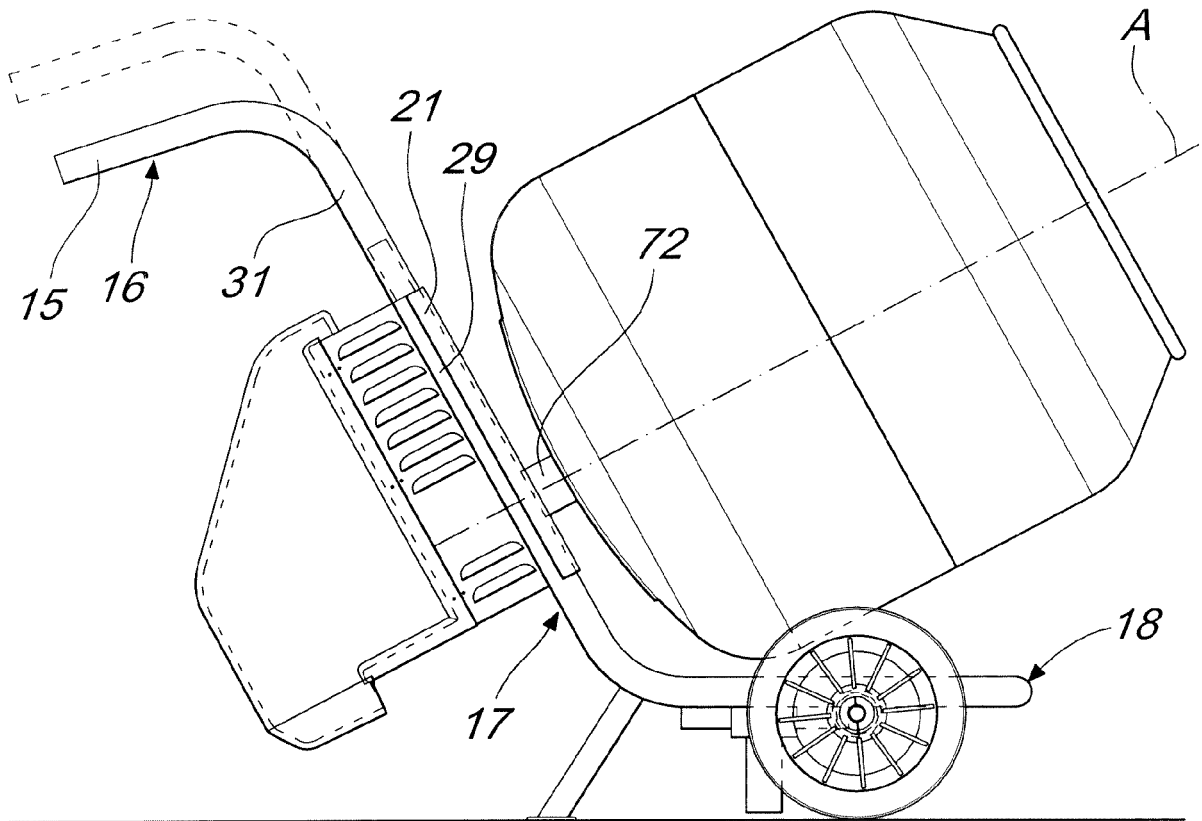


Fig. 3

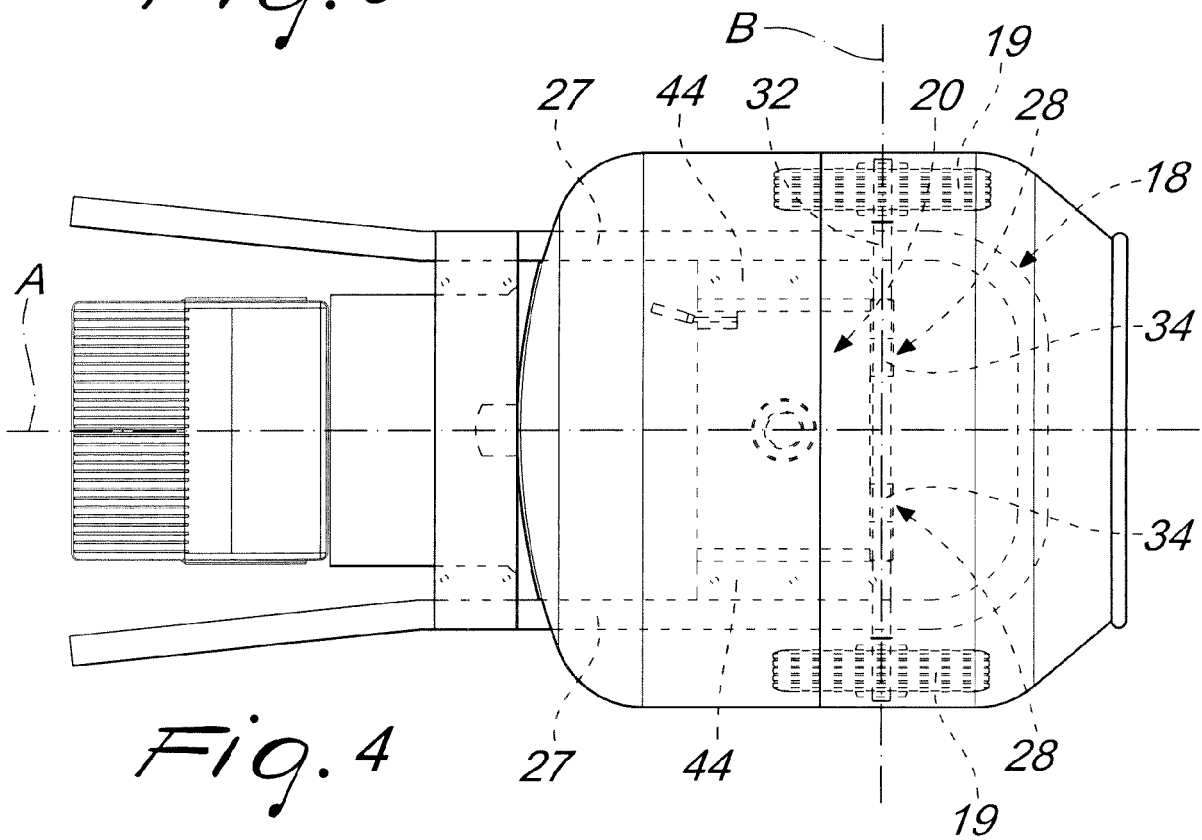
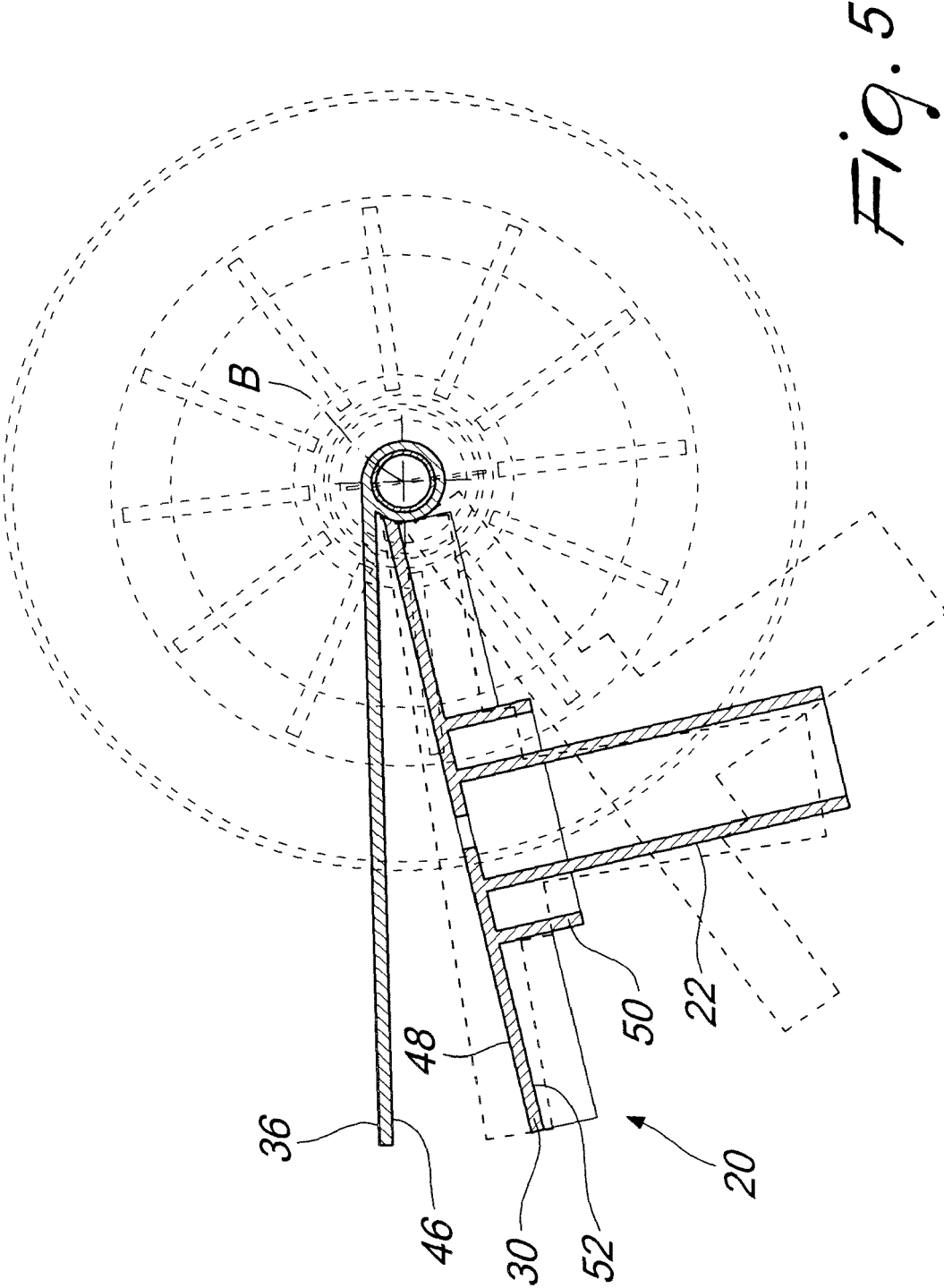
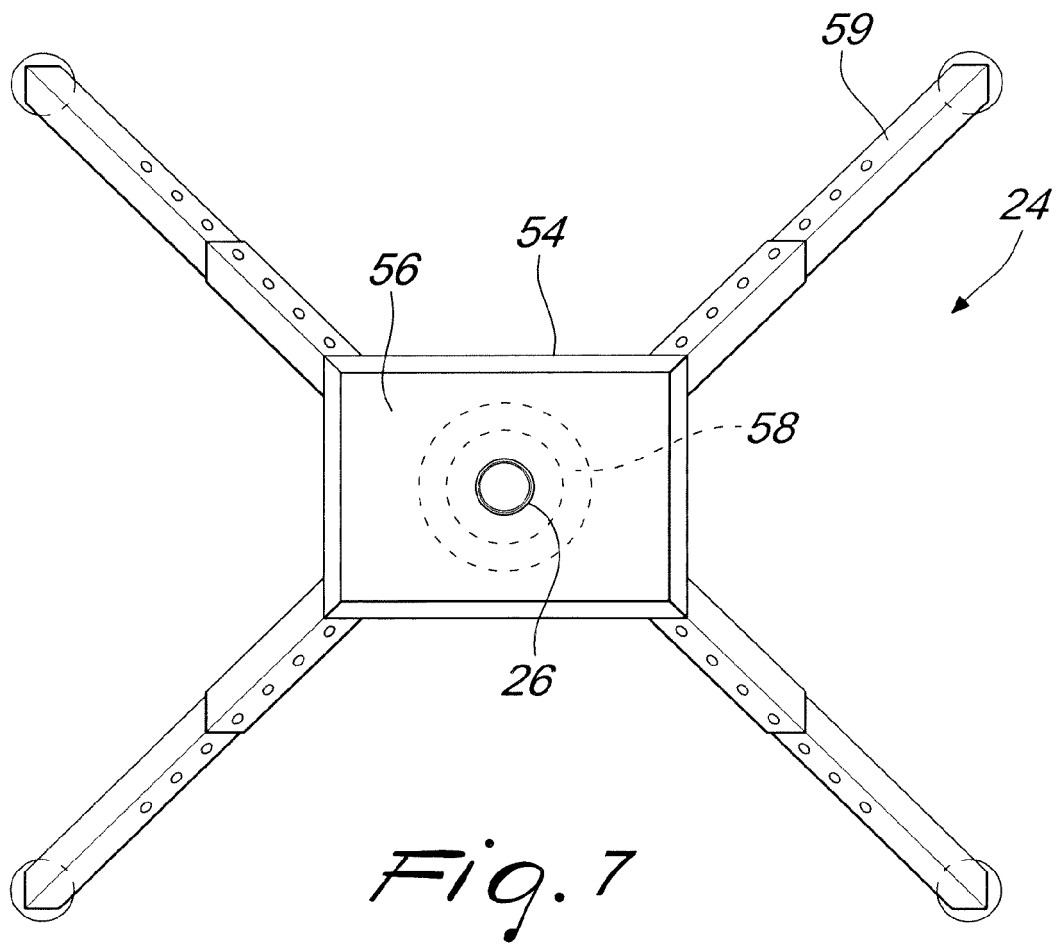
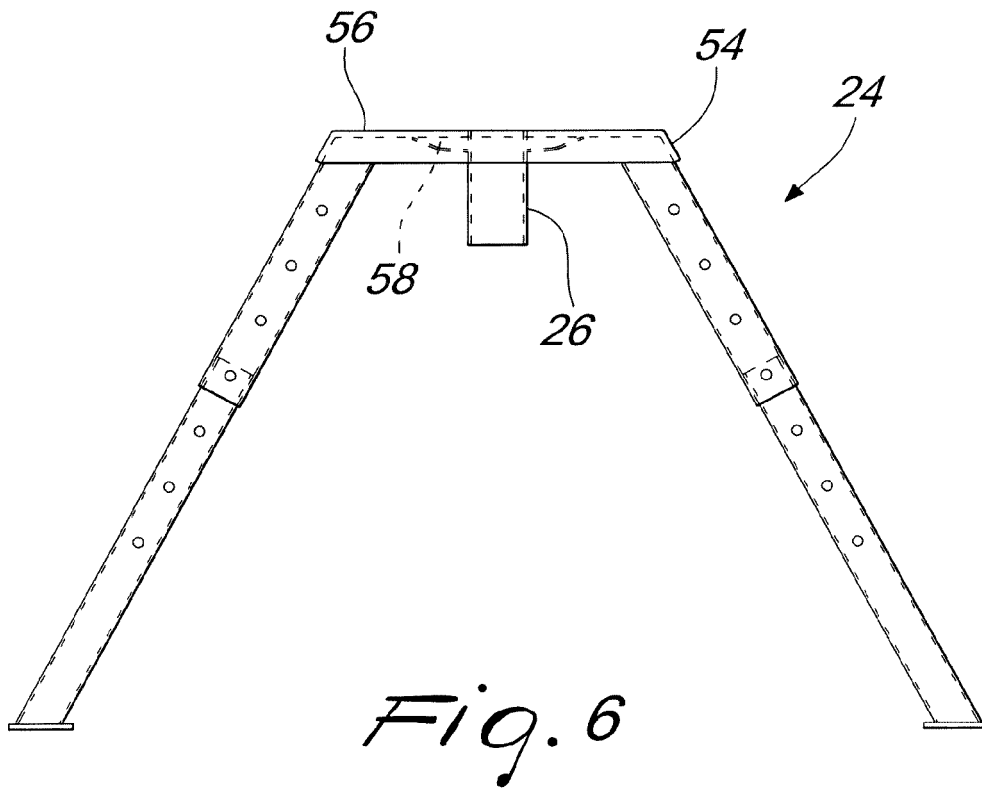


Fig. 4





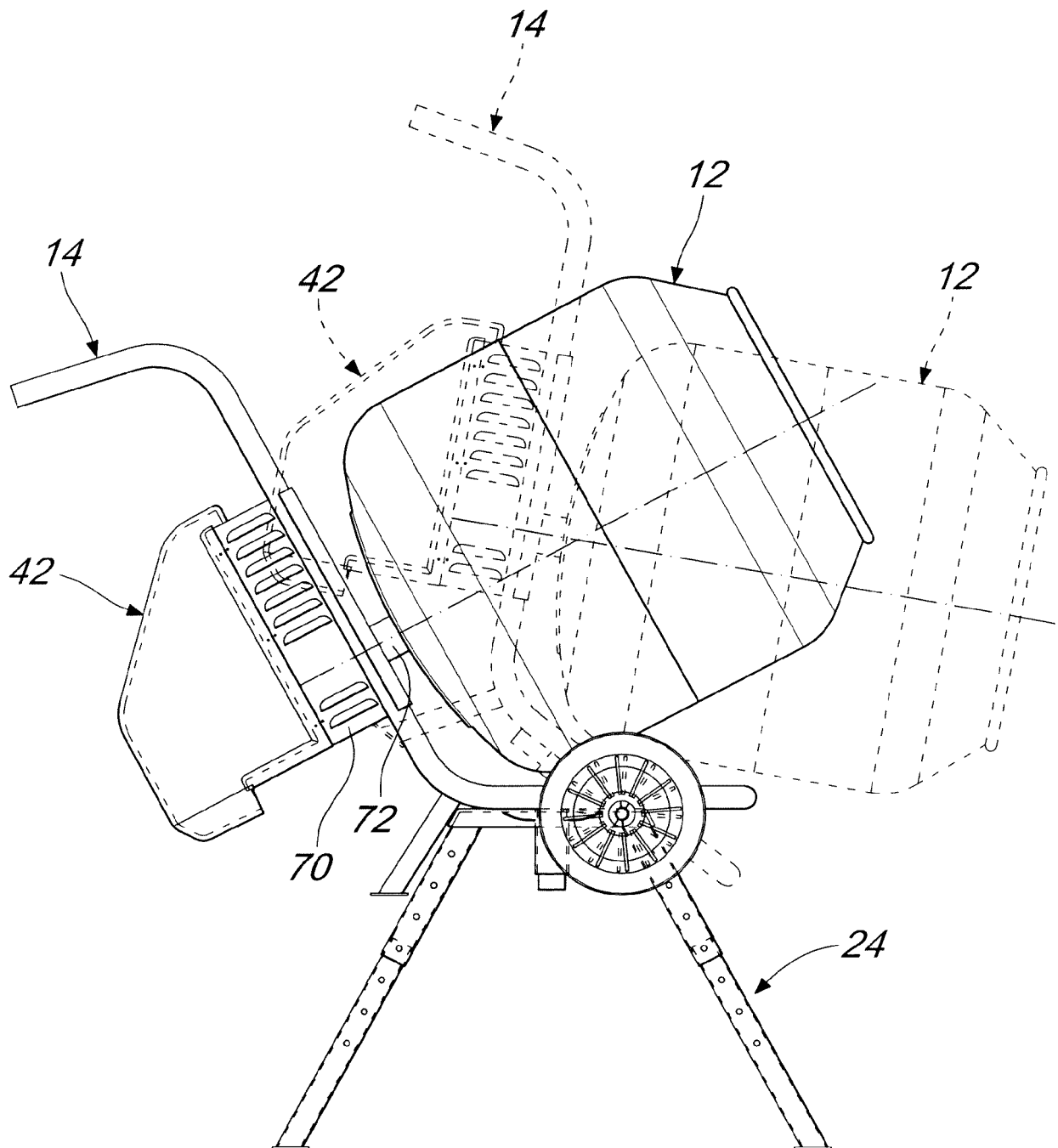


Fig. 8

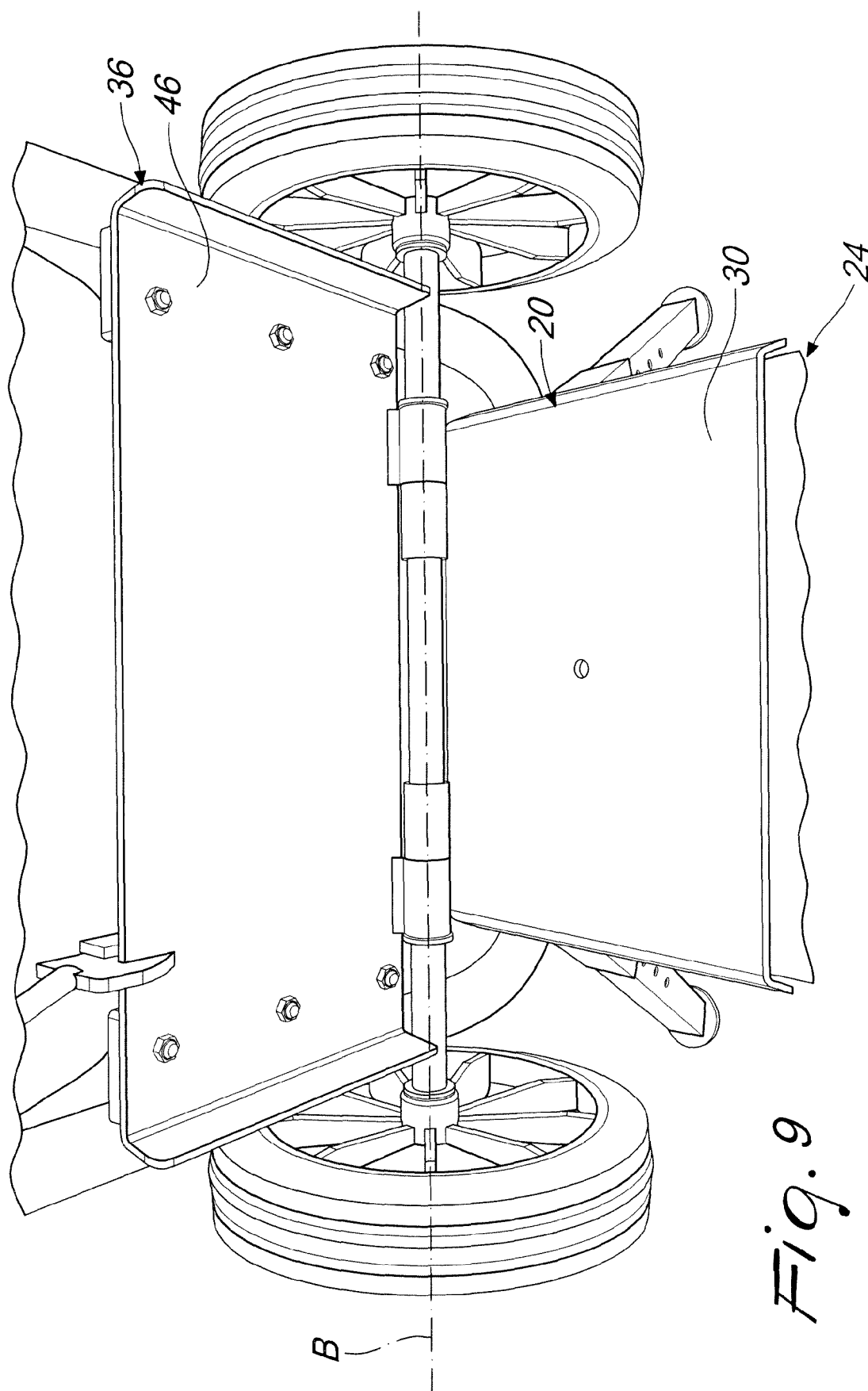


Fig. 9

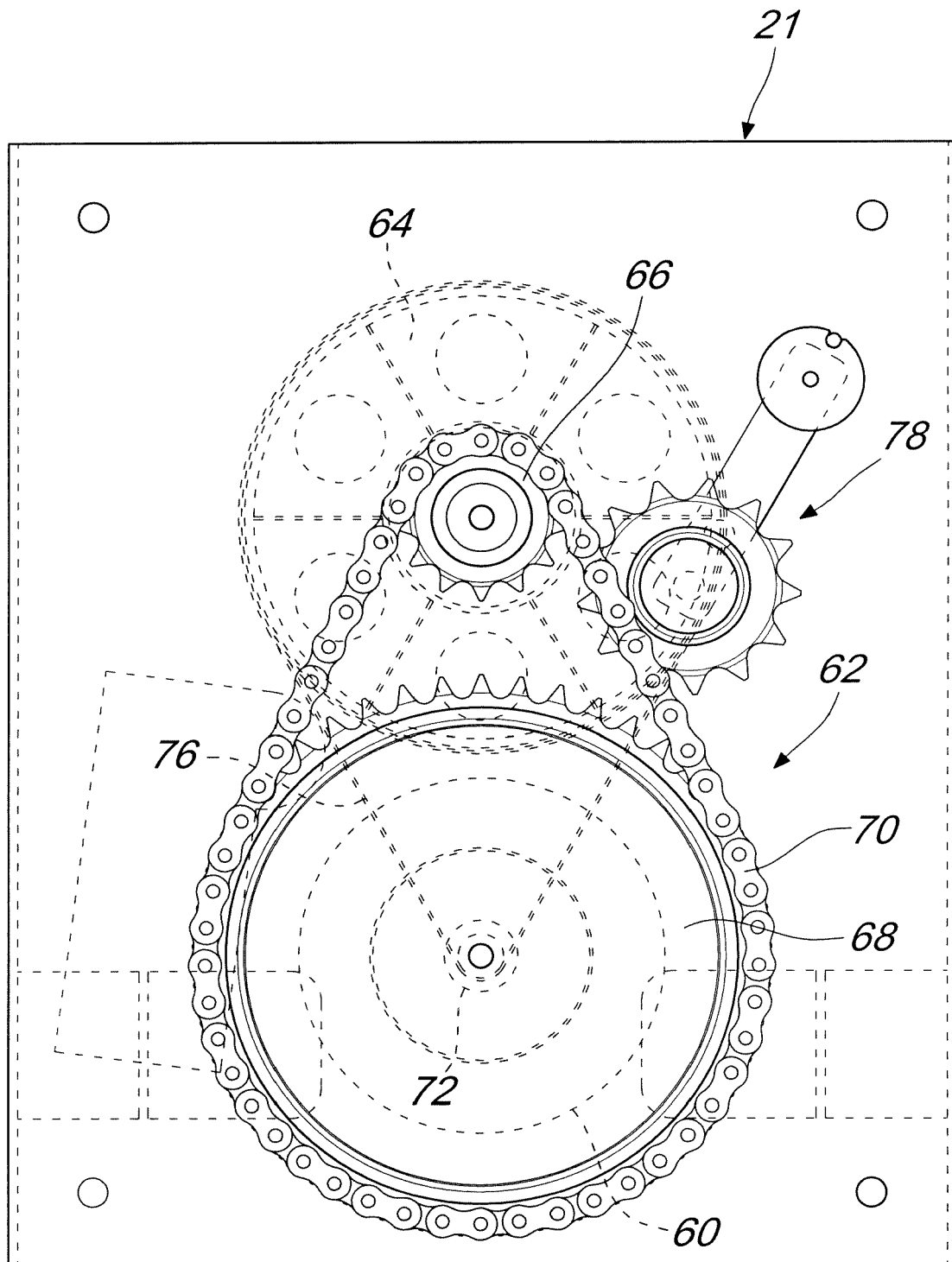


Fig. 10

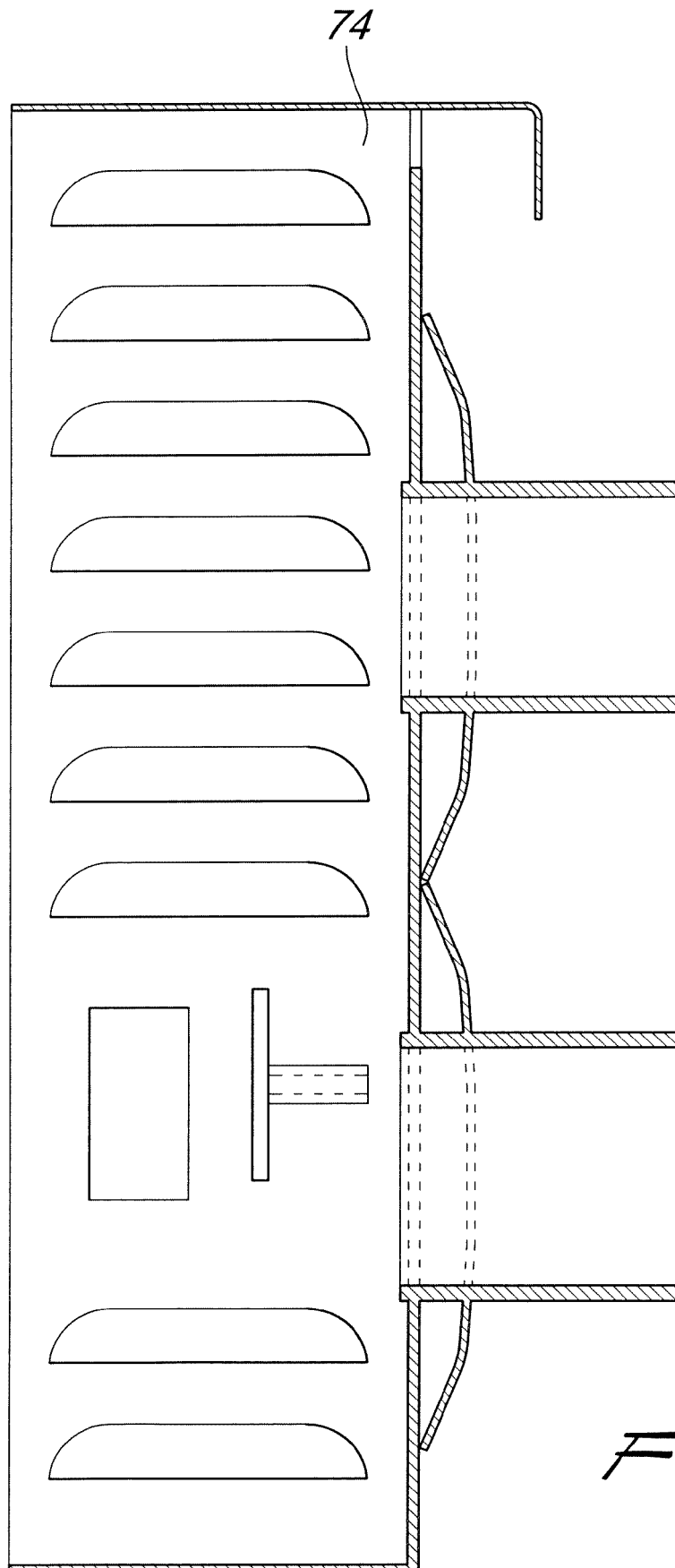


Fig. 11



EUROPEAN SEARCH REPORT

Application Number
EP 16 39 8007

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 921 189 B2 (BLACKHURST RONALD SAMUEL [GB]) 26 July 2005 (2005-07-26) * figures 1-4 * * column 3, lines 22-28 * * column 3, lines 42-53 * * column 4, lines 1,2 * * column 4, lines 19-33 *	1-6, 10-13	INV. B28C5/08 B01F9/06 B01F13/00 B01F15/02 B28C5/18
A	GB 2 463 003 A (HARRIS ERIC CHIGANEL [GB]) 3 March 2010 (2010-03-03) * figures 1-10 * * page 8, line 28 - page 10, line 10 *	1-13	
A	US 2013/201780 A1 (LIAO SHU-HUNG [TW]) 8 August 2013 (2013-08-08) * figures 5-13 * * paragraphs [0022], [0023], [0025] *	1-10	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 April 2017	Examiner Voltz, Eric
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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