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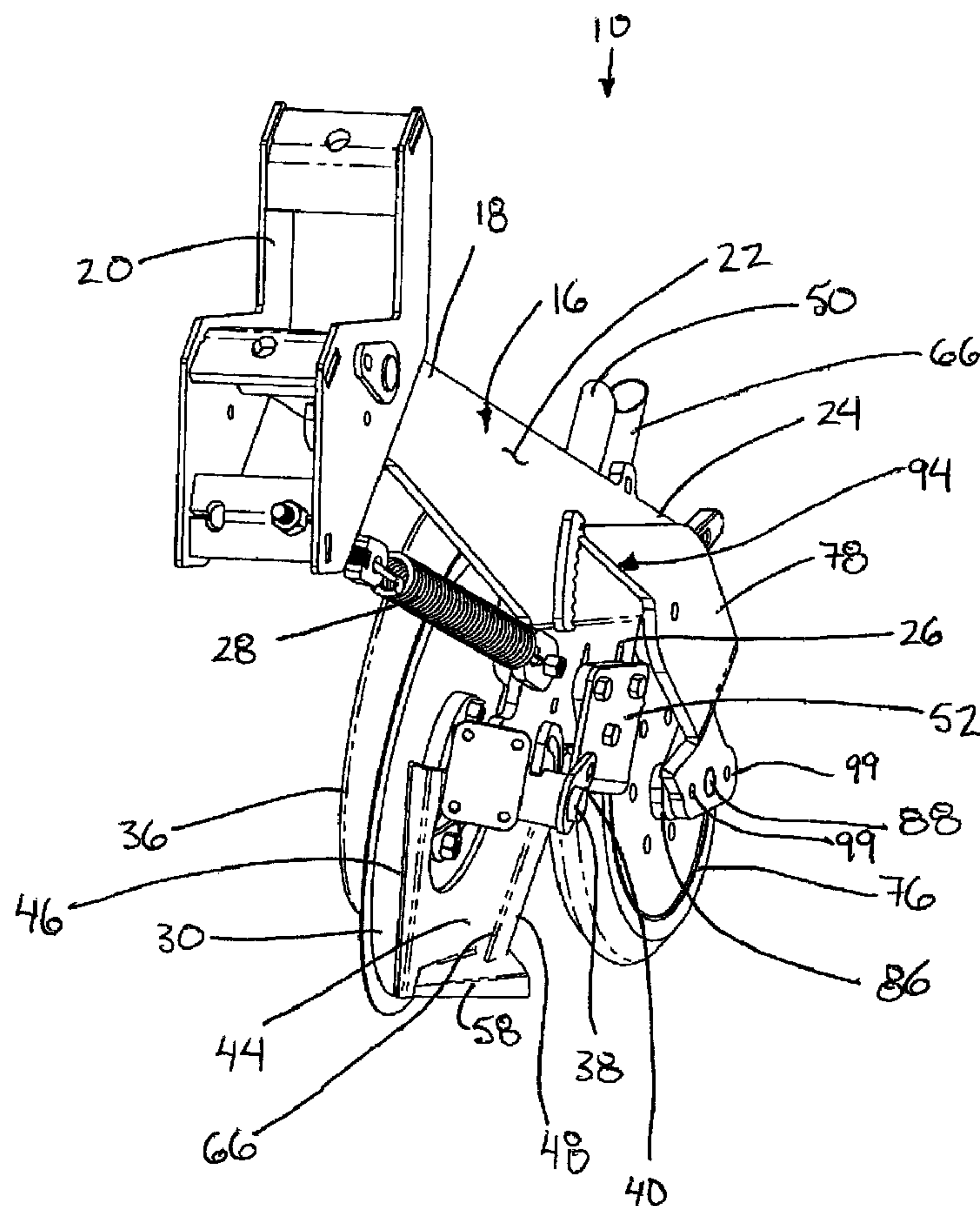
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(54) Title: DOUBLE SHOOT DISC OPENER



(57) Abrégé/Abstract:

A scraper is provided for a disc furrower opener in which a body of the scraper is arranged to be supported to one side of the disc to locate a fertilizer delivery tube therebetween. The leading edge of the scraper body is arranged to scrape the disc while a trailing



(57) **Abrégé(suite)/Abstract(continued):**

edge of the scraper body includes a seed tube formed integrally therewith for delivering seed into a groove formed along the side of the disc furrow by a wing member which extends laterally outwardly from a bottom end of the scraper body. In some embodiments a gauge wheel is provided adjacent the disc to gauge a depth of penetration of the disc and a packer wheel is provided on a trailing packer arm for packing disturbed soil in the furrow. The packer wheel is arranged to be supported in a first configuration where depth of penetration of the disc is gauged primarily by the gauge wheel and in a second configuration in which depth of penetration of the disc is gauged primarily by the packer wheel.

ABSTRACT

A scraper is provided for a disc furrower opener in which a body of the scraper is arranged to be supported to one side of the disc to locate a fertilizer delivery tube therebetween. The leading edge of the scraper body is arranged to
5 scrape the disc while a trailing edge of the scraper body includes a seed tube formed integrally therewith for delivering seed into a groove formed along the side of the disc furrow by a wing member which extends laterally outwardly from a bottom end of the scraper body. In some embodiments a gauge wheel is provided adjacent the disc to gauge a depth of penetration of the disc and a packer wheel is provided on a trailing
10 packer arm for packing disturbed soil in the furrow. The packer wheel is arranged to be supported in a first configuration where depth of penetration of the disc is gauged primarily by the gauge wheel and in a second configuration in which depth of penetration of the disc is gauged primarily by the packer wheel.

DOUBLE SHOOT DISC OPENER

FIELD OF THE INVENTION

The present invention relates to a double shoot disc opener, and more particularly relates to a disc opener comprising a disc for forming a primary furrow to deposit fertilizer therein and a scraper operable in cooperation with the disc having a wing member for forming a groove in the primary furrow to deposit seed therein.

BACKGROUND

No-tillage planting is an increasingly utilized planting technique in agriculture in which a furrow opener is typically provided in the form of a rotatable disc opener that fractures the soil into a furrow of disturbed soil. A seed boot is typically located to one side of the disc for placing seed into the furrow before closing the furrow. In planting the seed it is further desirable to deposit fertilizer in proximity to the seed in which a seed row is positioned upwardly and to one side of a fertilizer row in a single pass. US patents 7,004,090 and 7,152,539 both belonging to Swanson disclose examples of disc openers in which a wing is supported on the seed boot to support liquid fertilizer injection nozzles arranged to dispense liquid fertilizer in proximity to the seed row. The configuration of the injectors however causes the injectors to be readily subject to plugging which prevents effective fertilizer placement. Furthermore the location of the wing with the fertilizer nozzles thereon is supported on the seed boot so that the openers are unable to adequately place a seed row in a desired upward and laterally offset placement relative to a fertilizer row.

US 6,032,593 belonging to Wendling et al. discloses a further example of a drill opener for positioning seed and fertilizer rows in a single pass, however in order to do so a complex mechanism involving two discs for forming separate furrows is taught to be required. The resulting configuration is accordingly costly to

manufacture and requires more maintenance than a single disc opener.

Another example of a disc opener which attempts to place a seed row spaced from a fertilizer row in a single pass is available by Atom-Jet Industries of Brandon, Canada. A scraper is taught for attachment to a Case IH SDX disc opener in which a horizontal plate is supported integrally with the scraper to widen the furrow formed by the disc and form a shelf in the furrow while doing so. A deflector plate is provided in an upright orientation between a seed tube and a fertilizer tube between the scraper and the disc with the intention of depositing fertilizer at the bottom of the disc furrow while seed is intended to be deposited on the shelf formed by the horizontal plate. As the shelf is open to the deeper part of the furrow and the configuration of the seed boot is arranged to drop seed from above onto the seed shelf, it is possible that seed can readily bounce off of the seed shelf and into the deeper portion of the furrow adjacent the fertilizer where it is of little use.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a scraper device for use with a furrow opener comprising a disc arranged to be displaced across the ground in a forward working direction to open a primary furrow in the ground and a primary product delivery tube supported to one side of the disc in relation to the forward working direction to deposit a first product into the primary furrow, the scraper device comprising:

a scraper body arranged to be supported to one side of the disc such that the primary product delivery tube is supported between the disc and the scraper body, the scraper body extending generally rearward from a leading scraper edge of the scraper body to a rear trailing edge of the scraper body;

the leading scraper edge of the scraper body being arranged to be

supported in a generally upright orientation alongside the disc ahead of the primary product delivery tube so as to be arranged to scrape the disc;

the rear trailing edge of the scraper body being arranged to be supported spaced laterally outward from the disc rearward of the primary product
5 delivery tube;

a wing member supported on a bottom end of the scraper body in proximity to a bottom end of the disc so as to be arranged to extend laterally outwardly away from the disc to open a groove in the primary furrow projecting laterally to one side of the primary furrow; and

10 a secondary product delivery tube extending generally downward from an input opening at a top end of the secondary product delivery tube and arranged for receiving product therein, to an output opening at a bottom end of the secondary product delivery tube located adjacent the wing member and arranged for depositing the product through the secondary product delivery tube into the groove in the primary
15 furrow opened by the wing member.

According to a second aspect of the present invention there is provided a furrow opener device comprising:

a disc arranged to be displaced across the ground in a forward working direction to open a primary furrow in the ground;

20 a primary product delivery tube supported to one side of the disc in relation to the forward working direction to deposit a first product into the primary furrow;

a scraper body supported to one side of the disc such that the primary product delivery tube is supported between the disc and the scraper body, the scraper
25 body extending generally rearward from a leading scraper edge of the scraper body to

a rear trailing edge of the scraper body;

the leading scraper edge of the scraper body being supported in a generally upright orientation alongside the disc ahead of the primary product delivery tube so as to be arranged to scrape the disc;

5 the rear trailing edge of the scraper body being supported spaced laterally outward from the disc rearward of the primary product delivery tube;

a wing member supported on a bottom end of the scraper body in proximity to a bottom end of the disc to extend laterally outwardly away from the disc so as to be arranged to open a groove in the primary furrow projecting laterally to one
10 side of the primary furrow; and

a secondary product delivery tube extending generally downward from an input opening at a top end of the secondary product delivery tube and arranged for receiving product therein, to an output opening at a bottom end of the secondary product delivery tube located adjacent the wing member and arranged for depositing
15 the product through the secondary product delivery tube into the groove in the primary furrow opened by the wing member.

By providing a wing which extends outward from the bottom end of the scraper a groove can be formed in a side of the disc furrow which projects laterally outward therefrom with a layer of dirt being maintained above the wing to trap seed in
20 the groove formed and prevent seed bounce into the deeper part of the disc furrow. Further arranging the wing to slope downwardly and outwardly ensures that the seed is delivered to the most outward portion of the wing, farthest from the disc and farthest from the deeper part of the furrow where fertilizer is placed.

The primary product delivery tube is preferably arranged to deposit
25 fertilizer into the primary furrow and the secondary product delivery tube is preferably

arranged to deliver seed to the groove in the furrow spaced upwardly and to one side relative to the fertilizer.

The secondary product delivery tube may comprise an enclosed passage extending through the scraper body between the top end and the bottom end
5 of the scraper body.

The wing member may extend in the longitudinal direction with increasing lateral dimension from a front end at the leading scraper edge to a rear end at the rear trailing edge of the scraper body.

The wing member and the scraper body are preferably integrally formed
10 with one another.

A top side of the wing member preferably spans at slight upward incline from a front end to a back end of the wing member.

The wing member may extend laterally outwardly at a downward slope from the scraper body.

15 The outlet of the second product delivery tube is preferably only open to a rear side and a bottom side thereof below a top side of the wing member.

A top side of the wing member is preferably substantially below a gauge height which gauges depth of penetration of the disc into the ground such that the groove is arranged to be formed below a surface of the ground.

20 When a gauge wheel controls depth of penetration of the disc to form a furrow in the ground, preferably the wing member is substantially wholly located below the gauge wheel.

When the secondary product delivery tube outlet is open to a bottom side of the wing member, there may be provided a shield member spaced below the
25 outlet in close proximity thereto such that space between the wing member and the

shield is only open to a rear of the wing member.

Preferably the shield is sloped downwardly and laterally outwardly in relation to the disc.

The scraper body, the wing member and the second product delivery
5 tube may be adjustable in height together relative to the disc.

According to a further aspect of the present invention there is provided a furrow opener device arranged to be supported on an implement frame for being displaced across the ground in a forward working direction, the furrow opener comprising:

10 a disc arm arranged to be supported on the implement frame;

a disc supported on the disc arm to open a furrow in the ground when displaced in the forward working direction;

a product delivery tube to one side of the disc in relation to the forward working direction to deposit product into the furrow;

15 a gauge wheel supported adjacent the disc opposite the product delivery tube, the gauge wheel having a bottom end supported spaced above a bottom end of the disc for engaging the ground to gauge a depth of penetration of the disc into the ground;

a scraper body supported to one side of the disc such that the product
20 delivery tube is supported between the disc and the scraper body, the scraper body extending generally rearward from a leading scraper edge of the scraper body to a rear trailing edge of the scraper body;

the leading scraper edge of the scraper body being supported in a generally upright orientation alongside the disc ahead of the product delivery tube so
25 as to be arranged to scrape the disc;

the rear trailing edge of the scraper body being supported spaced laterally outward from the disc rearward of the product delivery tube;

a packer arm supported on the disc arm to extend rearwardly in relation to the disc;

5 a packer wheel supported on the disc arm rearwardly of the disc for packing disturbed soil in the furrow;

a packer mechanism supporting the packer wheel in first and second configurations relative to the disc arm wherein the depth of penetration of the disc is arranged to be gauged primarily by the gauge wheel in the first configuration and the
10 depth of penetration of the disc is arranged to be gauged primarily by the packer wheel in second configuration.

The packer mechanism may be arranged to pivotally support the packer arm on the disc arm such that the packer wheel is biased downwardly in relation to the disc arm in the first configuration, while also being arranged to fix the packer arm
15 relative to the disc arm in the second configuration.

Alternatively, when the packer arm is pivotally supported on the disc arm, the packer mechanism may be arranged to fix pivotal movement of the packer arm relative to the disc arm at different relative angular orientations corresponding to different heights of the packer wheel relative to the disc arm in the first and second
20 configurations respectively.

By providing both a gage wheel adjacent the disc and a packer wheel trailing the disc in which the packer can be supported in different configurations, the opener can be configured for optimum operation in both dryer or wetter conditions. For example in a dry year where more packing pressure is desired the packer arm
25 can be adjusted in an orientation relative to the disc arm to increase the pressure

thereof to the degree that the packer wheel effectively gauges the depth of penetration of the disc into the ground to control seed placement. Furthermore, the packer arm can be fixed in relation to the disc arm to yet further increase packing pressure. The gauge wheel then acts primarily as a cleaner wheel to clean the side of the disc and to prevent soil turning over on one side of the disc. In wetter years, the configuration of the packer arm can be adjusted so that more pressure is applied to the gauge wheel engaging the ground so that the gauge wheel effectively more accurately gauges depth of penetration of the disc as it rides along the ground directly beside the disc. In this instance the seed depth won't be affected by running over washout areas on a field for example. Less pressure can be applied by the packing wheel in this instance, which in a wetter year is less required due to the abundance of moisture which already assists in good seed growth. By providing a spring coupling the packer arm to the disc arm, the packer arm can be biased relative to the disc arm to provide some packing pressure while maintaining accuracy of depth of penetration of the disc using the gauge wheel.

The location of the wing to be effectively pulled through the ground below the surface of the ground has the additional advantage of avoiding straw being drawn into the furrow as the soil is disturbed below the surface rather than pulling material from the surface down into the ground.

One embodiment of the invention will now be described in conjunction with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of the furrow opener according to the present invention.

Figure 2 is a side elevational view of the first side of the furrow

illustrating placement of a seed row and fertilizer row in the ground.

Figure 3 is a rear elevational view of the opener in use in accordance with Figure 2.

Figure 4 is a schematic illustration of the furrow formed by the disc and
5 the groove formed in the furrow by the wing member.

Figure 5 is a side elevational view of a second side of the opener.

Figure 6 is a bottom plan view of the opener.

Figure 7 is a top plan view of the opener with the gauge wheel shown removed.

10 Figure 8 is a rear elevational view of the opener.

Figure 9 is a front elevational view of the opener with the gauge wheel shown removed.

Figure 10 is a perspective view of a bottom and rear of the opener with the packer wheels shown removed to illustrate an outlet of the fertilizer tube and the
15 seed tube.

Figure 11 is a schematic elevational view of a second embodiment of the opener.

In the drawings like characters of reference indicate corresponding parts in the different figures.

20 DETAILED DESCRIPTION

Referring to the accompanying figures there is illustrated a double shoot disc furrow opener generally indicated by reference numeral 10. A plurality of the openers 10 are arranged to be supported on a common implement frame for being towed across the ground in a forward working direction 14 for planting seed rows and
25 fertilizer rows in the ground.

The opener generally comprises a disc arm pivotally supported at a front end 18 on a suitable frame mount 20. The disc arm 16 includes a longitudinally extending portion 22 extending generally in the forward working direction 14 from the front end to a rear end 24 of the disc arm. The disc arm also includes a depending
5 portion 26 extending downward from the longitudinally extending portion 22 adjacent the rear end 24 thereof. A spring 28 is provided coupled adjustably between the frame mount 20 spaced below pivotal connection of the disc arm thereon and the depending portion 26 of the disc arm such that the spring is held under tension during normal operation to bias the disc arm downwardly into engagement with the ground.

10 A disc 30 is rotatably supported on a respective pivot shaft supported on the depending portion 26 of the disc arm, closer to the rear end than the front end thereof. The disc 30 is supported at a generally upright orientation inclined only slightly with respect to the forward working direction 14 while also being inclined slightly from a vertical plane. The inclination of the disc relative to the forward working
15 direction defines an outer leading side 32 of the disc which faces partially forward and laterally outwardly, and an inner trailing side 34 which faces laterally outwardly in the opposing direction and partly faces rearwardly.

A gauge wheel 36 is rotatably supported adjacent the disc 30 on the disc arm, so as to be located adjacent the leading side 32. The gauge wheel is
20 supported on the disc arm about a respective axis which is spaced generally upwardly and rearwardly in relation to the axis of the disc 30 with the gauge wheel also being smaller in diameter than the gauge wheel so that the bottom of the gauge wheel is spaced upwardly from a bottom end of the disc to control depth of penetration of the disc into the ground when the gauge wheel 36 rides along the surface of the ground.
25 Position of the gauge wheel is adjustable relative to the disc for adjusting the depth of

penetration of the disc. The gauge wheel 36 also functions to clean the outer side of the disc due to the close proximity thereof.

The gauge wheel is adjustably supported on the disc arm by a shaft 38 which extends concentrically through a pivot shaft supporting the disc 30 and which
5 mounts levers 40 on the inner and outer ends thereof. The gauge wheel 36 is rotatably supported on the free end of the lever 40 at the outer side of the disc so as to be radially offset from the shaft 38. Accordingly rotation of the shaft causes the lever 40 at the outer end to be rotated therewith for positioning the axis of the gauge wheel at the free end thereof upwardly and downwardly when the lever is arranged to
10 extend generally rearwardly in normal operation.

An anchor plate 42 is provided at the inner side of the disc in fixed relation to the disc arm for cooperation with the lever 40 at the inner end of the shaft 38. An arcuate shaped slot is provided in the anchor plate which extends partway about a circumference of the shaft 38 for alignment with a fastener aperture at a free
15 end of the lever 40 on the inner end of the shaft. A suitable fastener can be provided in cooperation between the fastener aperture and the lever and the arcuate slot for selectively fixing the lever 40 at various angular positions about an axis of the shaft. As both levers are rotatable with the shaft fixing the position of the inner end of the lever 40 with a fastener suitably fixes position of the lever at the outer end to fix
20 position of the gauge wheel thereon.

A scraper body 44 is mounted on the inner side of the disc arm 16 to be positioned alongside the inner side of the disc. The scraper body extends generally rearwardly alongside the disc from a leading edge 46 ahead of the disc axis to a trailing edge 48 which is spaced rearwardly from the disc axis. The leading edge 46 is
25 arranged to be generally upright alongside the disc to extend at a generally rearward

incline from a top end in substantially horizontal alignment with the disc axis to a bottom end near a bottom end of the disc directly below the axis of the disc. The leading edge 46 is positioned directly against the inner side of the disc so as to be arranged to scrape the disc as the disc is rotated as it is displaced through the
5 ground.

The scraper body 44 spans rearwardly at an outward incline to be spaced laterally from the disc towards the trailing edge 48. The trailing edge 48 is positioned near a rear of the disc in the longitudinal direction spaced laterally outward therefrom sufficiently to receive a primary product delivery tube 50 extending
10 downwardly from the disc arm therebetween.

The scraper body includes a bracket portion 52 extending upwardly near the trailing edge 48 thereof for connection to the disc arm to support the scraper body fixed on the disc arm. Vertical slots are provided on the depending portion of the disc arm for cooperation with fasteners received through cooperating apertures on the
15 bracket portion of the scraper body so that the scraper body can be fastened to the disc arm at various positions along the slots corresponding to various heights of the scraper body relative to the disc.

The first product delivery tube 50 includes an input 54 adjacent the top end thereof which is arranged for connection to a product delivery tube on the
20 implement frame which delivers fertilizer in particulate form in a preferred embodiment. The product is then received through the product tube 50 to be dispensed from an output 56 at a bottom end of the tube which is positioned just slightly rearwardly of the disc axis between the disc and the scraper body to deposit the first product through the primary product delivery tube 50 into the deepest portion
25 of the furrow formed by the disc between the bottom end of the scraper body and the

bottom end of the disc.

A wing member 58 is supported on the bottom end of the scraper body to extend generally laterally outwardly therefrom. The wing member 58 is formed integrally with the scraper body and extends near horizontal in a longitudinal direction in line with the forward working direction from a front end at the bottom of the leading edge 46 to a rear end spaced laterally outwardly in relation to the disc. The wing member 58 has an increasing lateral cross section from the front end to the rear end thereof so as to define a generally wedge shape when viewed from above.

The wing member 58 includes a top plate 60 which spans a full length of the wing member from the front end to the rear end thereof and a full width from the scraper body to extend laterally outwardly at a downward and outward incline towards the outer side edge 62 of the wing member 58. The top plate 60 extends rearwardly from the front end to the rear end near horizontal but at a slight upward incline. An inner edge of the wing member opposite the outer edge 62 is formed integrally with the scraper body so that the wing member is adjacent to the disc at the front end but is spaced outwardly from the disc adjacent the rear end thereof.

The increased lateral dimension of the wing 58 at the rear end causes the outer edge to extend laterally outwardly from a position adjacent the disc at the front end to a position spaced laterally outwardly from the disc sufficiently that the wing member forms a groove in a side of the furrow formed by the disc in which the groove extends laterally outwardly in relation to the furrow into the surrounding ground below a surface of the ground where seed can be deposited at the free end of the groove 64 farthest from the furrow receiving the fertilizer therein. The groove 64 is arranged to be formed below the surface of the ground due to the location of the wing member 58 arranged to be supported below ground in operation due to the top plate

being spaced below the bottom end of the gauge wheel so as to be spaced below a gauge height of the disc opener which gauges depth of penetration of the disc to form the disc furrow.

A secondary product delivery tube 66 is provided for delivering seed
5 therethrough for being deposited in the groove 64 formed in the side of the disc furrow by the wing member 58. The secondary product delivery tube 66 comprises a passage extending through the scraper body so as to be fully enclosed between an input 68 at a top end of the scraper body arranged for connection to a seed delivery tube of a seeding implement for receiving seed, to an output 70 at a bottom end of the
10 scraper body to deposit seed from the wing member 58 at the outermost point of the groove 64 relative to the primary furrow formed by the disc. The output 70 is arranged to be near the bottom of the disc wherein a plane of the opening is generally horizontal and open through the bottom side of the top plate 60 forming the wing member 58. The outer edge 62 of the wing member extends downwardly from the top
15 plate along the length of the wing member to define a height of the groove 64 formed in the earth as the wing member passes through the ground. The output 70 is located adjacent the rear of the scraper body so as to be spaced laterally outwardly in relation to the disc.

A shield member 72 is supported generally parallel and spaced below
20 the top plate 60 of the wing member so as to extend generally horizontally in the longitudinal direction a length of the wing member and the width thereof spanning generally between the scraper body and the outer edge 62. Accordingly an outlet chamber 74 is defined within the space between the shield member and the top plate of the wing members spaced thereabove with the two being joined together at the
25 front end and along both sides thereof so that the outlet chamber 74 is only open to a

rear and to a bottom of the wing member. The close proximity of the shield member 72 to the outlet opening or output 70 if the second product delivery tube 66 prevents dirt and debris from entering the output and thereby prevents plugging. The shield member 72 extends rearwardly past the output 70. The shield member is sloped
5 generally downwardly and outwardly from the scraper body to the outer edge of the top plate 60 so that seed deposited thereon by the secondary product delivery tube 66 is encourage to be displaced towards the outer free end spaced farthest from the disc in operation.

A packer wheel 76 is provided spaced rearwardly from the disc by a
10 packer arm 78. The packer arm 78 is pivotally connected at a front end 80 thereof to a rear end of the disc arm at a location spaced upwardly and rearwardly from the disc. Pivoting the packer arm 78, which extends generally rearwardly from the disc arm and which mounts the packer wheel 76 rotatably on the rear end 82 thereof, effectively causes the height of the packet wheel 76 relative to the disc support on the disc arm
15 to be adjusted. The packer wheel 76 is arranged to be rotatable about a respective axis extending near horizontally and near perpendicular to the forward working direction of the opener. The packer wheel is arranged to track the disc for packing the disturbed soil in the furrow as the opener passes over the ground.

The packer wheel 76 is rotatably supported on a respective post 84
20 defining the axis of rotation of the wheel. The post 84 is fixed on a rocker plate 86 which is in turn supported in the packer arm 78 at the rear end thereof. A center of the rocker plate 86 is secured to the rocker plate 86 by a central pivot bolt 88 at the axis of rotation of the post 84. Front and rear flanges 90 and 92 extend forwardly and rearwardly respectively from the post 84 to define the rocker plate 86. The front and
25 rear flanges are oriented so as to have an interior angle therebetween which is less

than 180 degrees on the interior side supporting the post and wheel thereon.

The opposing side of the rocker plate is secured against a flat portion of the disc arm by flange fasteners 99 with the center pivot bolt 88 being at a center between the front and rear flanges. Each of the front and rear flanges locates one of the flange fasteners 99 adjacent the free end thereof so as to be arranged to fix the spacing of the free end of the respective flange relative to the disc arm. By alternately positioning the front flange adjacent the disc arm with the rear flange spaced therefrom and the rear flange adjacent the disc arm with the front flange spaced therefrom, the rocker plate 86 is arranged to be pivoted within a range of several degrees about a generally vertical axis so that the post 84 and packer wheel supported thereon are effectively also rotated about the vertical axis for adjusting an inclination of the packer wheel 76 relative to a vertical plane in the forward working direction as desired to accommodate different packing configurations.

In the preferred embodiment, pivotal positioning of the packer arm relative to the disc arm about the respective pivotal connection therebetween is arranged to be fixed in place at one of various positions by a suitable latch 94. The latch 94 comprises a lever arm 96 which is pivotal about an axis of rotation of the packer arm relative to the disc arm between an unlatched position in which the packer arm is freely rotatable relative to the disc arm and a latched position in which the packer arm is clamped laterally inwardly towards the disc arm along the axis of rotation to restrict further relative rotation therebetween.

The latch includes a cam lock mechanism which is operated by the lever to effect the clamping of the arms to one another. To positively fix position of the packer arm relative to the disc arm when the two arms are clamped together, the forward end of the packer arm includes a forwardly projecting portion which defines a

lug 98 at a pointed tip which aligns with a selected one of a plurality of mating sockets 100 positioned and fixed along an arc like path on the disc arm at a location spaced ahead of pivotal connection of the packer arm on the disc arm.

Accordingly in order to change the position of the packer arm and
5 accordingly the height of the packer wheel relative to the disc arm, a user first displaces the lever 96 into the unlatched position so that the cam member causes the packer arm to be separated sufficiently from the disc arm in an axial direction of the pivot that the lug 98 may be released from a respective one of the mating sockets 100 to permit angular adjustment of the packer arm relative to the disc arm so that the lug
10 can be aligned with a different socket. At this point, switching the lever arm to the latched position causes the lug 98 to be received within the next mating socket to positively lock the packer arm at the selected orientation relative to the disc arm.

By providing both a gauge wheel or cleaner wheel on the disc which is adjustable in height relative to the disc and a packer arm with a packer wheel thereon
15 which is also adjustable in height relative to the disc, the packer and gauge wheel can be adjusted so that in a first configuration depth of penetration of the disc to form the furrow is gauged primarily by the gauge wheel which bears the most pressure on the surface of the ground due to its lower height relative to the packer wheel, and a second configuration in which depth of penetration of the disc is gauged primarily by
20 the packer wheel by selecting height of the packer wheel to be lower than height of the gauge wheel to bear greater pressure on the surface of the ground.

Accordingly when the earth is dryer and increased packing pressure is desired to effect better covering of the seed the configuration of the packer arm and gauge wheel can be selected to be in the second configuration in which increased
25 pressure on the packer wheel causes gauging of seed depth to be controlled primarily

by the packer wheel. Alternatively when seeding in wetter soils, it may be preferable to instead more accurately control the seed depth by using the gauge wheel which is more accurate at controlling penetration of the disc due to its proximity to the disc. The result is less packing pressure on the packing wheel which can be
5 accommodated in wetter seasons due to increased germination capacity from the additional moisture in the soil.

In an alternative embodiment shown in Figure 11, the packer arm 78 may include a hinge 102 formed therein spaced rearwardly from pivotal connection of the packer arm onto the disc arm. A spring 104 is provided at the hinge 102 which
10 biases a rearward portion of the packer arm supporting the packer wheel thereon downwardly in relation to a forward portion of the packer arm pivotally supported on the disc arm. A similar configuration of latch 94 is provided at pivotal connection of the forward portion the packer arm on the disc arm. In this configuration adjusting the latch 94 to lower the packer arm relative to the disc arm effectively increases the
15 spring pressure applied by the spring 104 to increase downward pressure of the packer wheel. Alternatively, raising the packer arm relative to the disc arm at the latch 94 causes the spring pressure to be decreased. Use of the spring permits accuracy of depth control to be gauged by the gauge wheel while also permitting increased or decreased spring pressure and accordingly packing pressure to be applied
20 independently of the depth control of the disc. The packer arm may further be configured to selectively fix the hinge 102 in place to allow a user selection between apply spring pressure to the packer wheel or to fix the packer wheel relative to the disc arm as may be desired.

In either embodiment, the opener described herein permits a furrow to
25 be formed with a groove extending laterally from one side of the furrow below the

ground so that a fertilizer row can be deposited in particulate form or liquid form to the deepest part of the furrow while seed can be deposited through the second product delivery tube in the wing member to an outermost portion of the groove farthest from the fertilizer in the furrow so that a seed row is formed spaced upwardly and laterally
5 outwardly in relation to the fertilizer row in a desirable configuration. The narrow height of the wing member and its position below the ground prevents any seed being deposited therein from bouncing into the furrow with the fertilizer due to the layer of earth above the groove which immediate traps the seed within the groove. Furthermore the configuration of the passage to be fully enclosed up to the output
10 which terminates within an outlet chamber 74 defined between the top plate and the shield member 72 ensures that seed is trapped therein and is only permitted to be deposited through the rearward facing opening at the rear of the wing member. The laterally outward and downward inclination of the wing member further ensures that seed is deposited farthest from the furrow to prevent bouncing seed falling into the
15 deepest part of the furrow with the fertilizer where it is ineffective.

Since various modifications can be made in my invention as herein above described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without department from such spirit and scope, it is intended that all matter contained in the accompanying specification shall
20 be interpreted as illustrative only and not in a limiting sense.

CLAIMS:

1. A furrow opener device comprising:

a disc arranged to be displaced across the ground in a forward working direction to open a primary furrow in the ground;

5 a primary product delivery tube supported to one side of the disc in relation to the forward working direction to deposit a first product into the primary furrow;

a scraper body supported to one side of the disc such that the primary product delivery tube is supported between the disc and the scraper body, the scraper
10 body extending generally rearward from a leading scraper edge of the scraper body to a rear trailing edge of the scraper body;

the leading scraper edge of the scraper body being supported in a generally upright orientation alongside the disc ahead of the primary product delivery tube so as to be arranged to scrape the disc;

15 the rear trailing edge of the scraper body being supported spaced laterally outward from the disc rearward of the primary product delivery tube;

a wing member supported on a bottom end of the scraper body in proximity to a bottom end of the disc to extend laterally outwardly away from the disc so as to be arranged to open a groove in the primary furrow projecting laterally to one
20 side of the primary furrow; and

a secondary product delivery tube extending generally downward from an input opening at a top end of the secondary product delivery tube and arranged for receiving product therein, to an output opening at a bottom end of the secondary product delivery tube located adjacent the wing member and arranged for depositing
25 the product through the secondary product delivery tube into the groove in the primary

furrow opened by the wing member.

2. The device according to Claim 1 wherein the primary product delivery tube is arranged to deposit fertilizer into the primary furrow and the secondary product delivery tube is arranged to deliver seed to the groove in the furrow spaced
5 upwardly and to one side relative to the fertilizer.

3. The device according to any one of Claims 1 or 2 wherein the secondary product delivery tube comprises an enclosed passage extending through the scraper body between the top end and the bottom end of the scraper body.

4. The device according to any one of Claims 1 through 3 wherein
10 the wing member extends in the longitudinal direction with increasing lateral dimension from a front end at the leading scraper edge to a rear end at the rear trailing edge of the scraper body.

5. The device according to any one of Claims 1 through 4 wherein the wing member and the scraper body are integrally formed with one another.

15 6. The device according to any one of Claims 1 through 5 wherein a top side of the wing member spans at slight upward incline from a front end to a back end of the wing member.

7. The device according to any one of Claims 1 through 6 wherein the wing member extends laterally outwardly at a downward slope from the scraper
20 body.

8. The device according to any one of Claims 1 through 7 wherein the outlet of the second product delivery tube is only open to a rear side and a bottom side thereof below a top side of the wing member.

9. The device according to any one of Claims 1 through 8 wherein a
25 top side of the wing member is substantially below a gauge height which gauges

depth of penetration of the disc into the ground such that the groove is arranged to be formed below a surface of the ground.

10. The device according to any one of Claims 1 through 9 wherein there is provided a gauge wheel controlling depth of penetration of the disc to form a furrow in the ground and the wing member is substantially wholly located below the gauge wheel.

11. The device according to any one of Claims 1 through 10 wherein the secondary product delivery tube outlet is open to a bottom side of the wing member and wherein there is provided a shield member spaced below the outlet in close proximity thereto such that space between the wing member and the shield is only open to a rear of the wing member.

12. The device according to any one of Claims 11 wherein the shield is sloped downwardly and laterally outwardly in relation to the disc.

13. The device according to any one of Claims 1 through 12 wherein the scraper body, the wing member and the second product delivery tube are adjustable in height together relative to the disc.

14. The device according to any one of Claims 1 through 13 further comprising:

a packer arm supported on the disc arm to extend rearwardly in relation to the disc;

a packer wheel supported on the disc arm rearwardly of the disc for packing disturbed soil in the furrow; and

an angle adjustment mechanism arranged to support the packer wheel on the disc arm at a plurality of different orientations pivoted relative to one another about a substantially vertical axis.

15. The device according to any one of Claims 1 through 14 further comprising:

a gauge wheel supported adjacent the disc opposite the product delivery tube, the gauge wheel having a bottom end supported spaced above a bottom end of the disc for engaging the ground to gauge a depth of penetration of the disc into the ground;

a packer arm supported on the disc arm to extend rearwardly in relation to the disc;

a packer wheel supported on the disc arm rearwardly of the disc for packing disturbed soil in the furrow; and

a packer mechanism supporting the packer wheel in first and second configurations relative to the disc arm wherein the depth of penetration of the disc is arranged to be gauged primarily by the gauge wheel in the first configuration and the depth of penetration of the disc is arranged to be gauged primarily by the packer wheel in second configuration.

16. The device according to Claim 15 wherein the packer mechanism is arranged to pivotally support the packer arm on the disc arm such that the packer wheel is biased downwardly in relation to the disc arm in the first configuration and the packer mechanism is arranged to fix the packer arm relative to the disc arm in the second configuration.

17. The device according to Claim 15 wherein the packer mechanism is arranged to support the packer wheel in fixed relation to the disc arm in the first and second configurations at different respective heights relative to disc arm.

18. The device according to Claim 15 wherein the packer arm is pivotally supported on the disc arm and the packer mechanism is arranged to fix

pivotal movement of the packer arm relative to the disc arm at different relative angular orientations corresponding to different heights of the packer wheel relative to the disc arm in the first and second configurations respectively.

19. A scraper device for use with a furrow opener comprising a disc
5 arranged to be displaced across the ground in a forward working direction to open a primary furrow in the ground and a primary product delivery tube supported to one side of the disc in relation to the forward working direction to deposit a first product into the primary furrow, the scraper device comprising:

a scraper body arranged to be supported to one side of the disc such
10 that the primary product delivery tube is supported between the disc and the scraper body, the scraper body extending generally rearward from a leading scraper edge of the scraper body to a rear trailing edge of the scraper body;

the leading scraper edge of the scraper body being arranged to be
supported in a generally upright orientation alongside the disc ahead of the primary
15 product delivery tube so as to be arranged to scrape the disc;

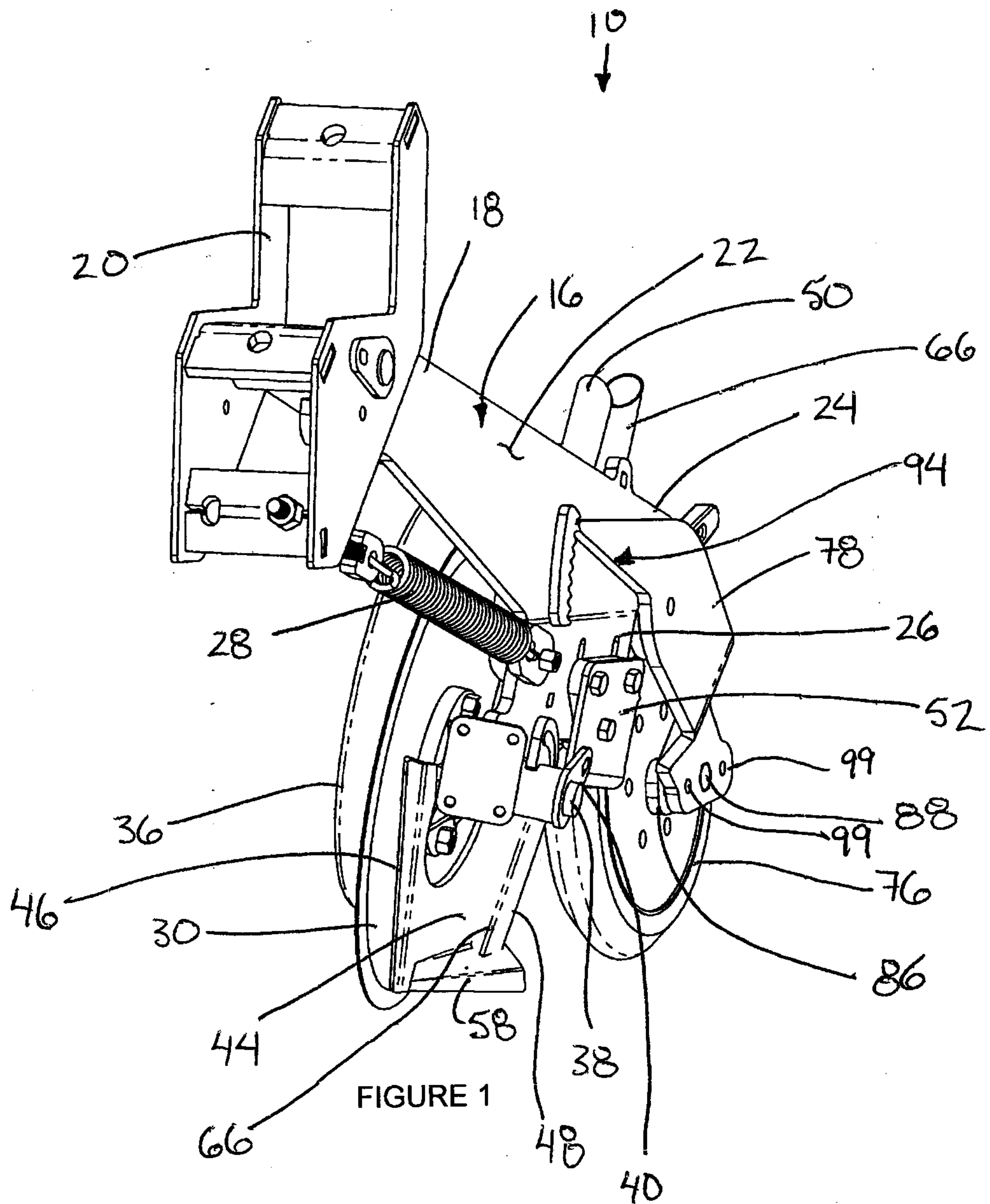
the rear trailing edge of the scraper body being arranged to be
supported spaced laterally outward from the disc rearward of the primary product
delivery tube;

a wing member supported on a bottom end of the scraper body in
20 proximity to a bottom end of the disc so as to be arranged to extend laterally outwardly away from the disc to open a groove in the primary furrow projecting laterally to one side of the primary furrow; and

a secondary product delivery tube extending generally downward from
an input opening at a top end of the secondary product delivery tube and arranged for
25 receiving product therein, to an output opening at a bottom end of the secondary

product delivery tube located adjacent the wing member and arranged for depositing the product through the secondary product delivery tube into the groove in the primary furrow opened by the wing member.

FROM



FROM

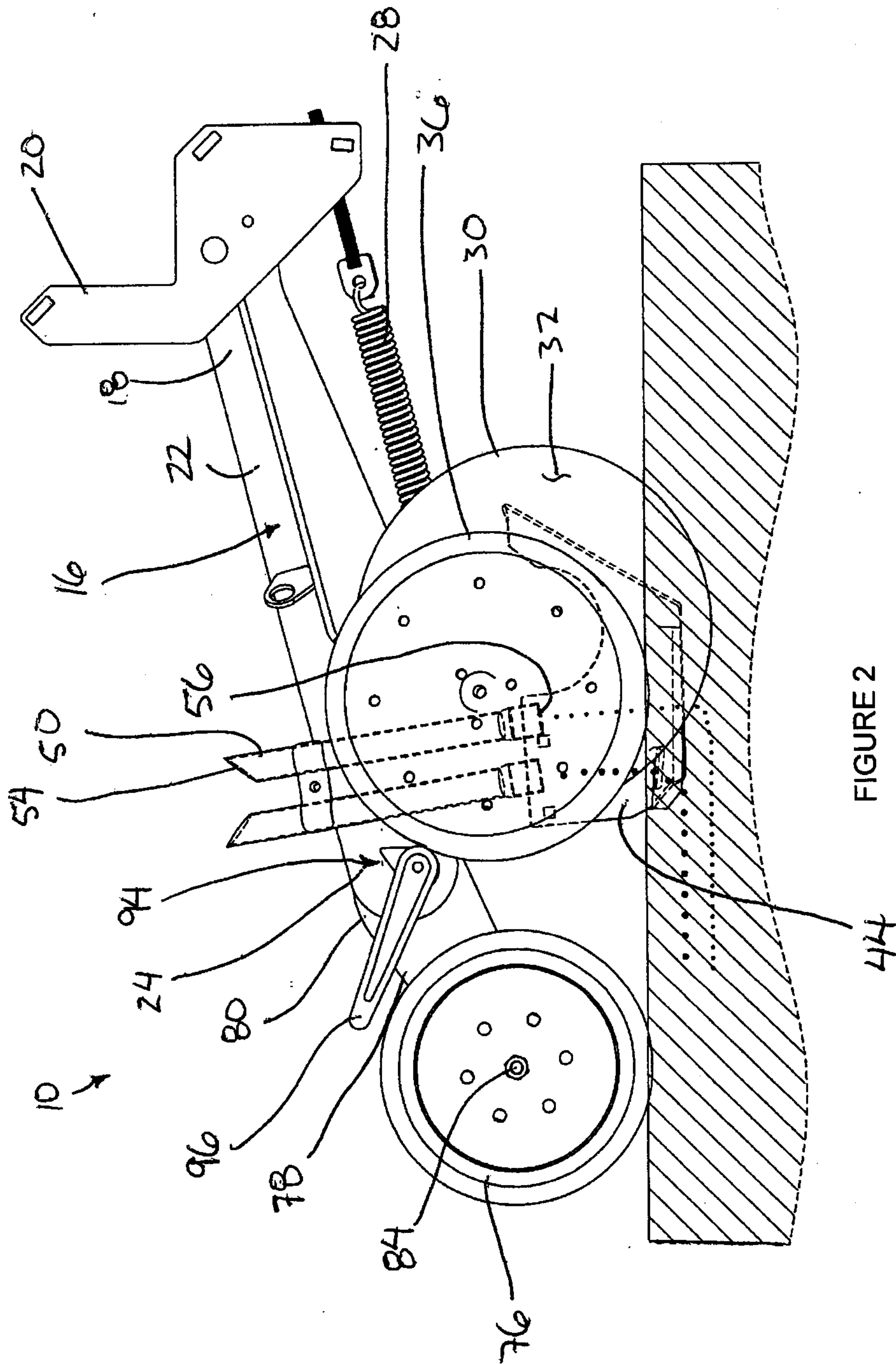


FIGURE 2

FROM

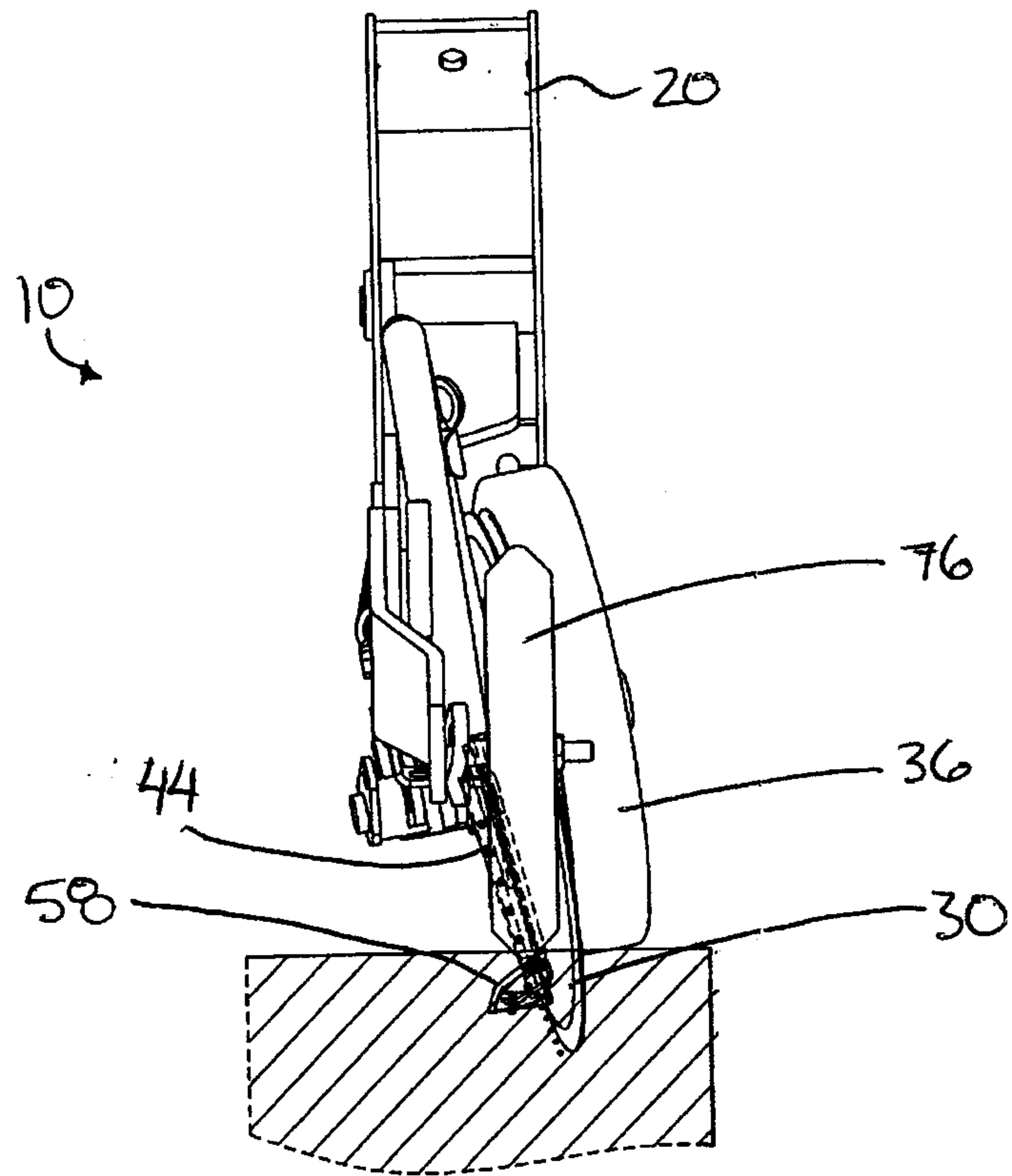


FIGURE 3

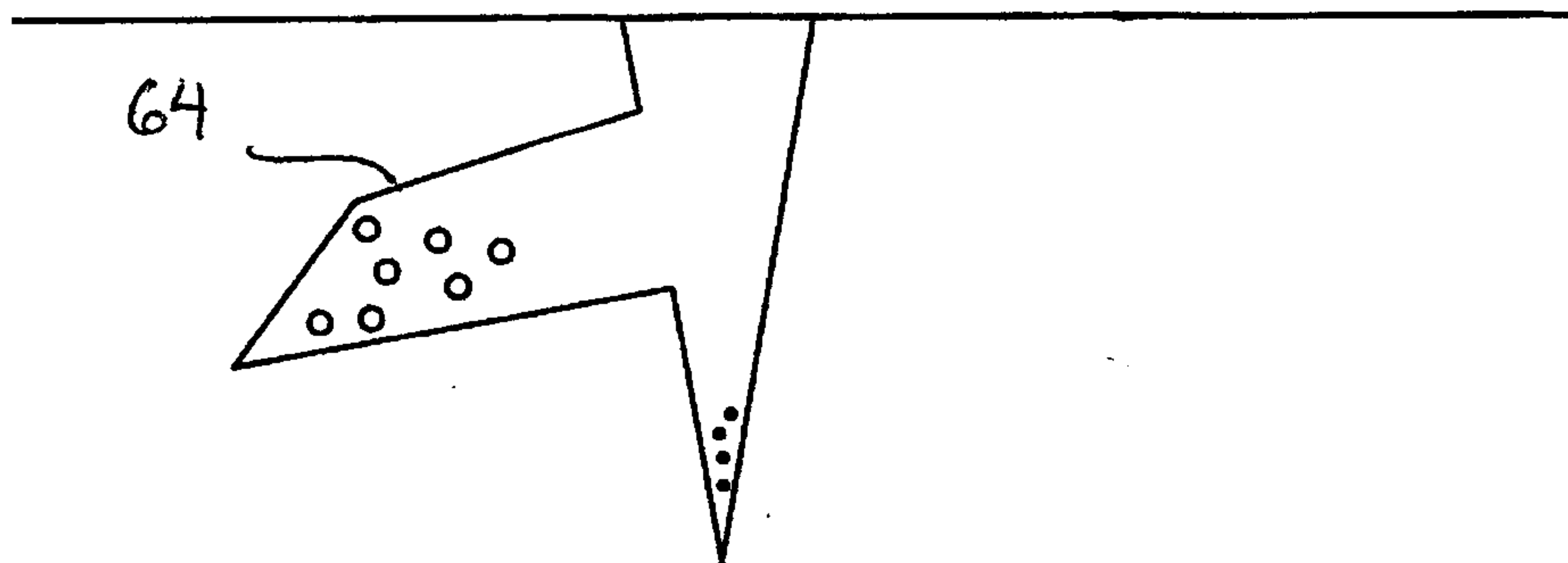


FIGURE 4

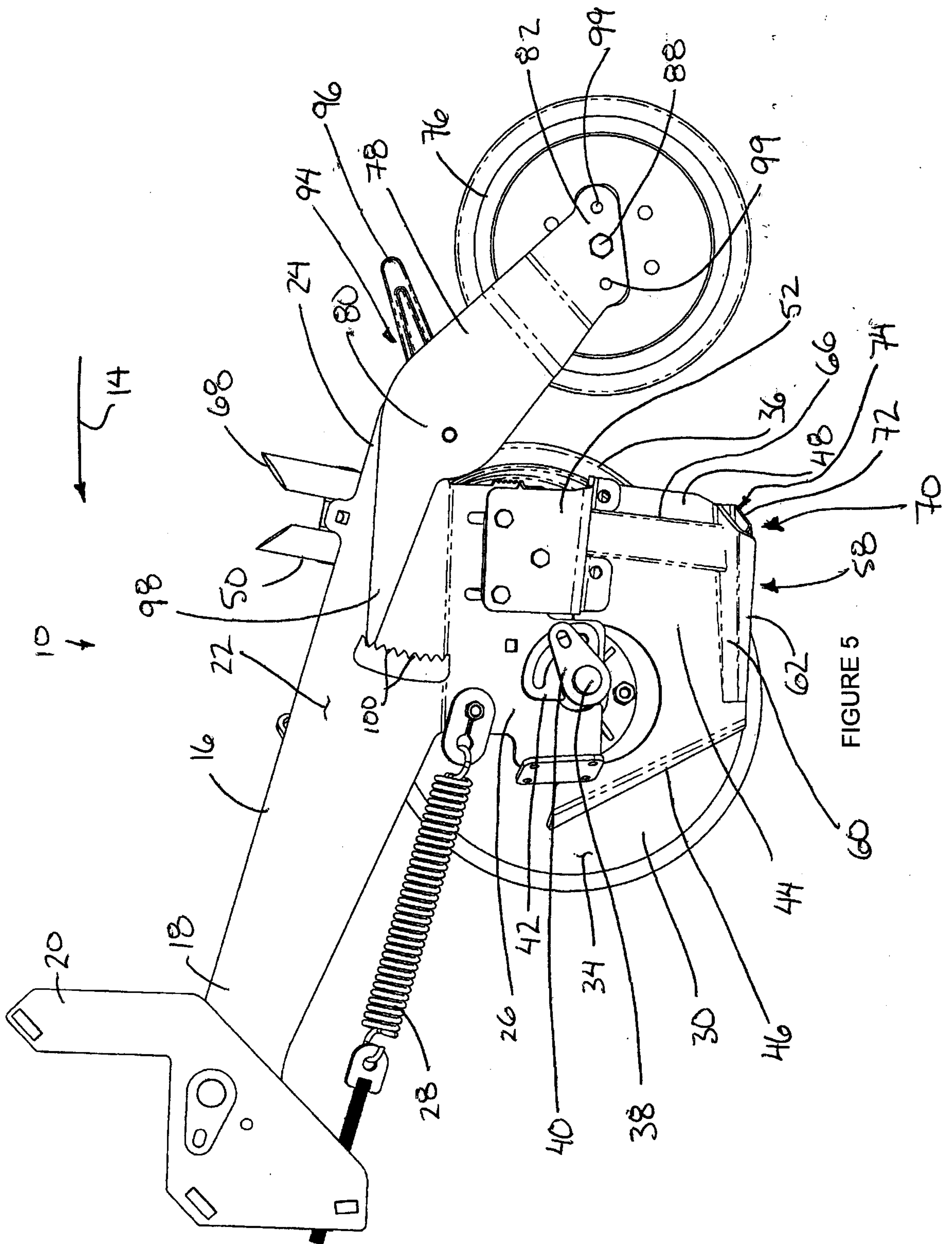
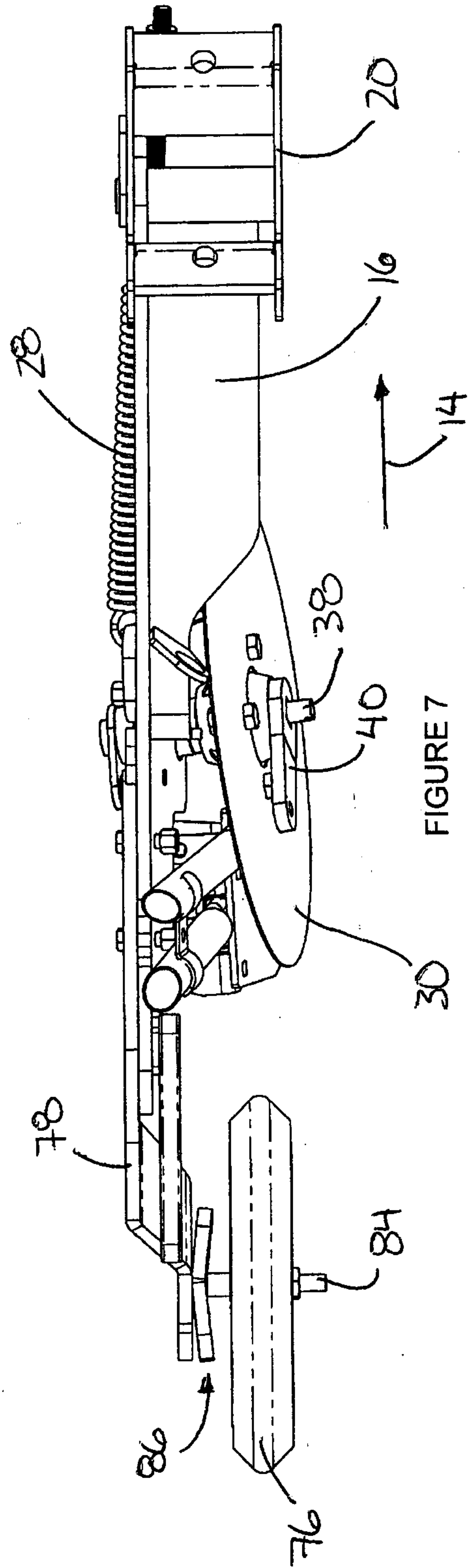
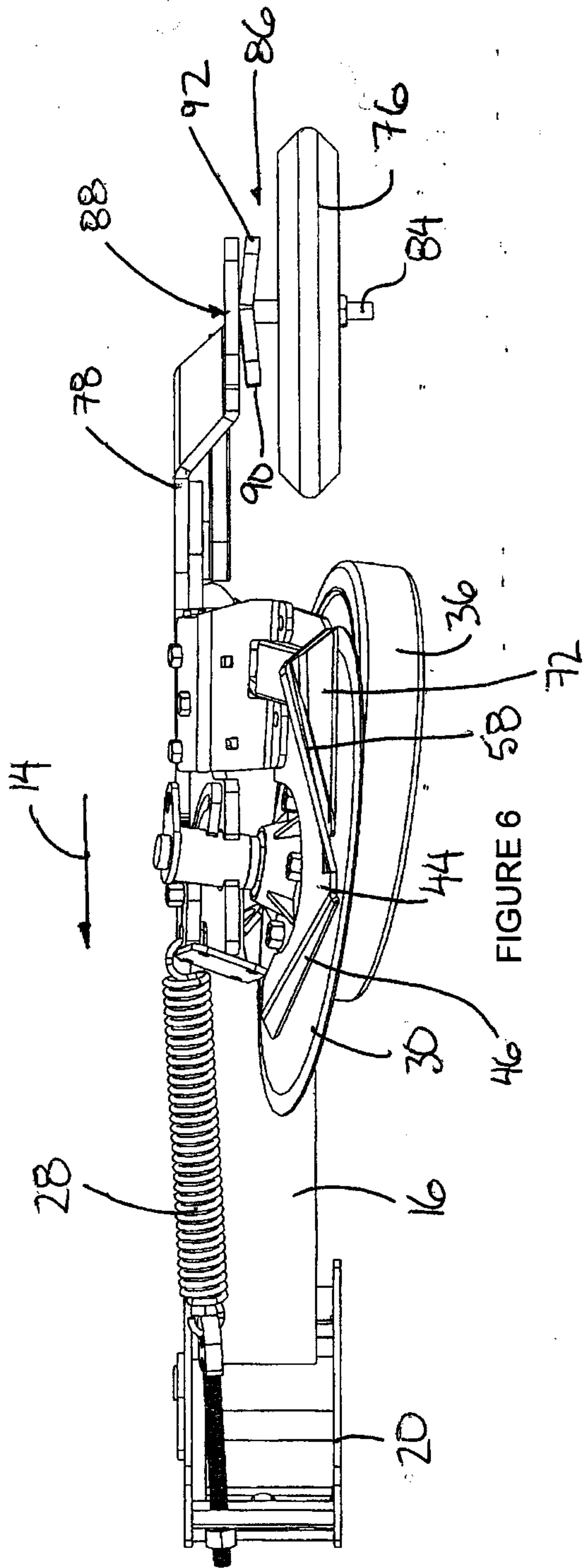


FIGURE 5

FROM



FROM

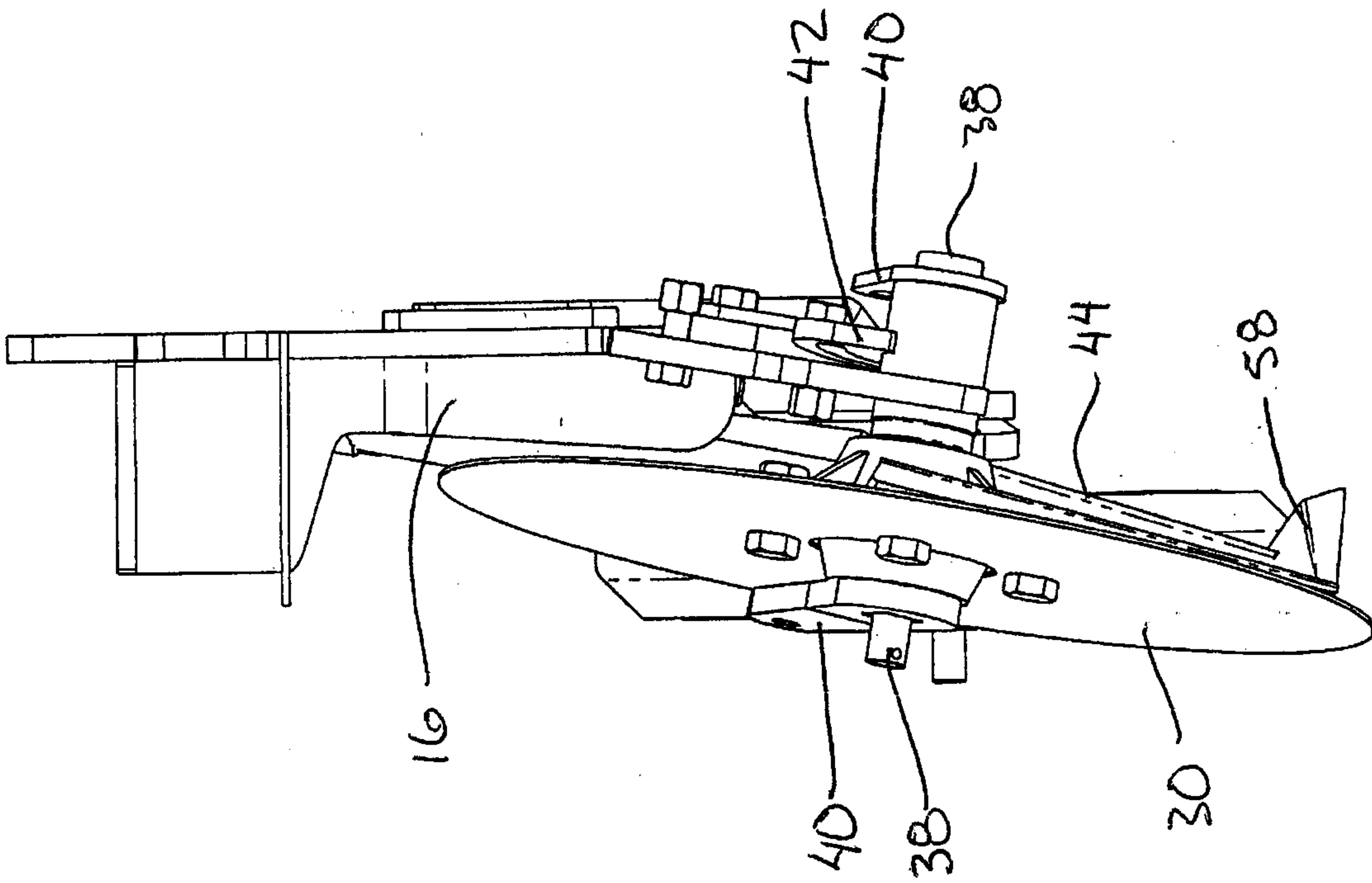


FIGURE 9

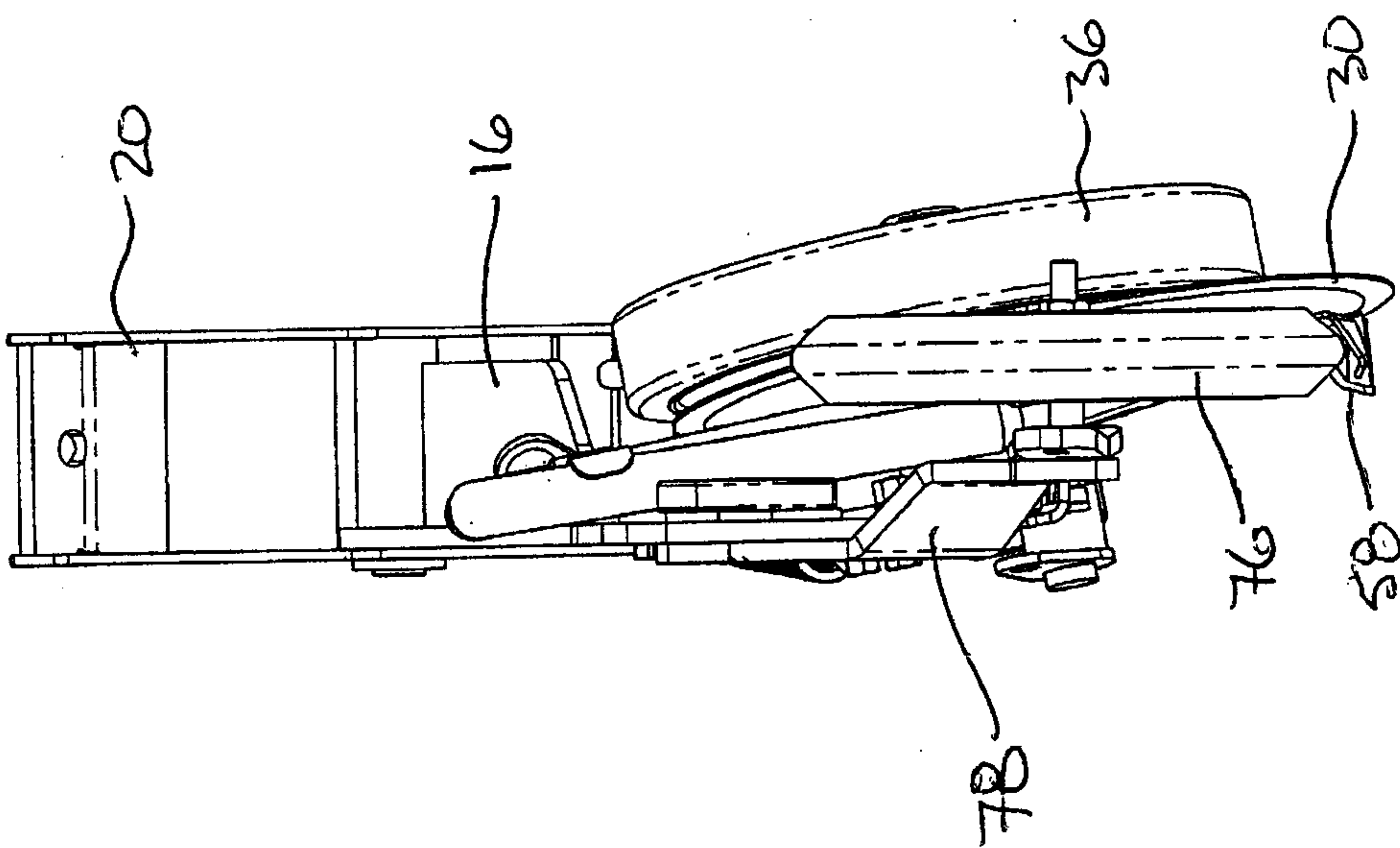


FIGURE 8

FROM

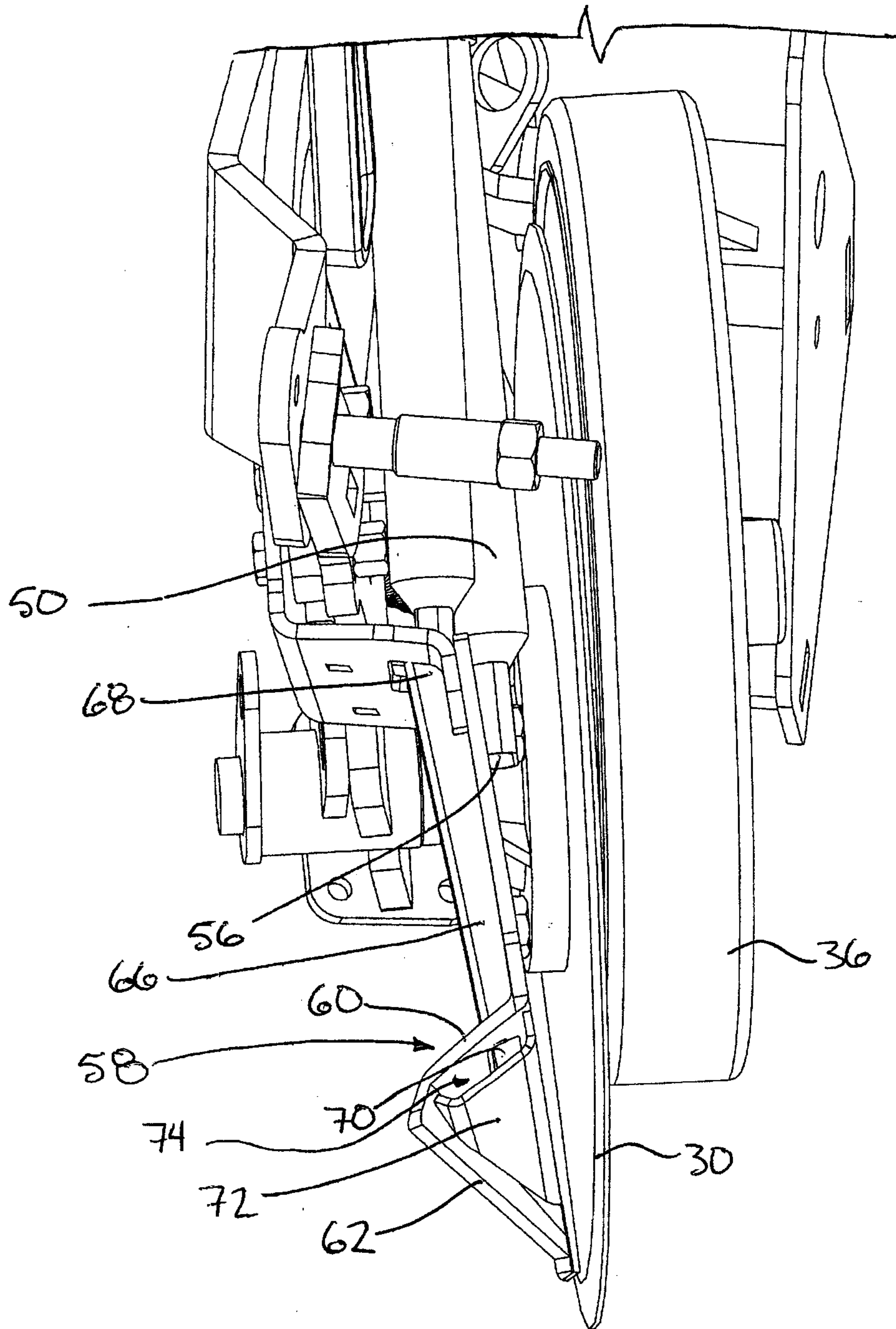


FIGURE 10

FROM

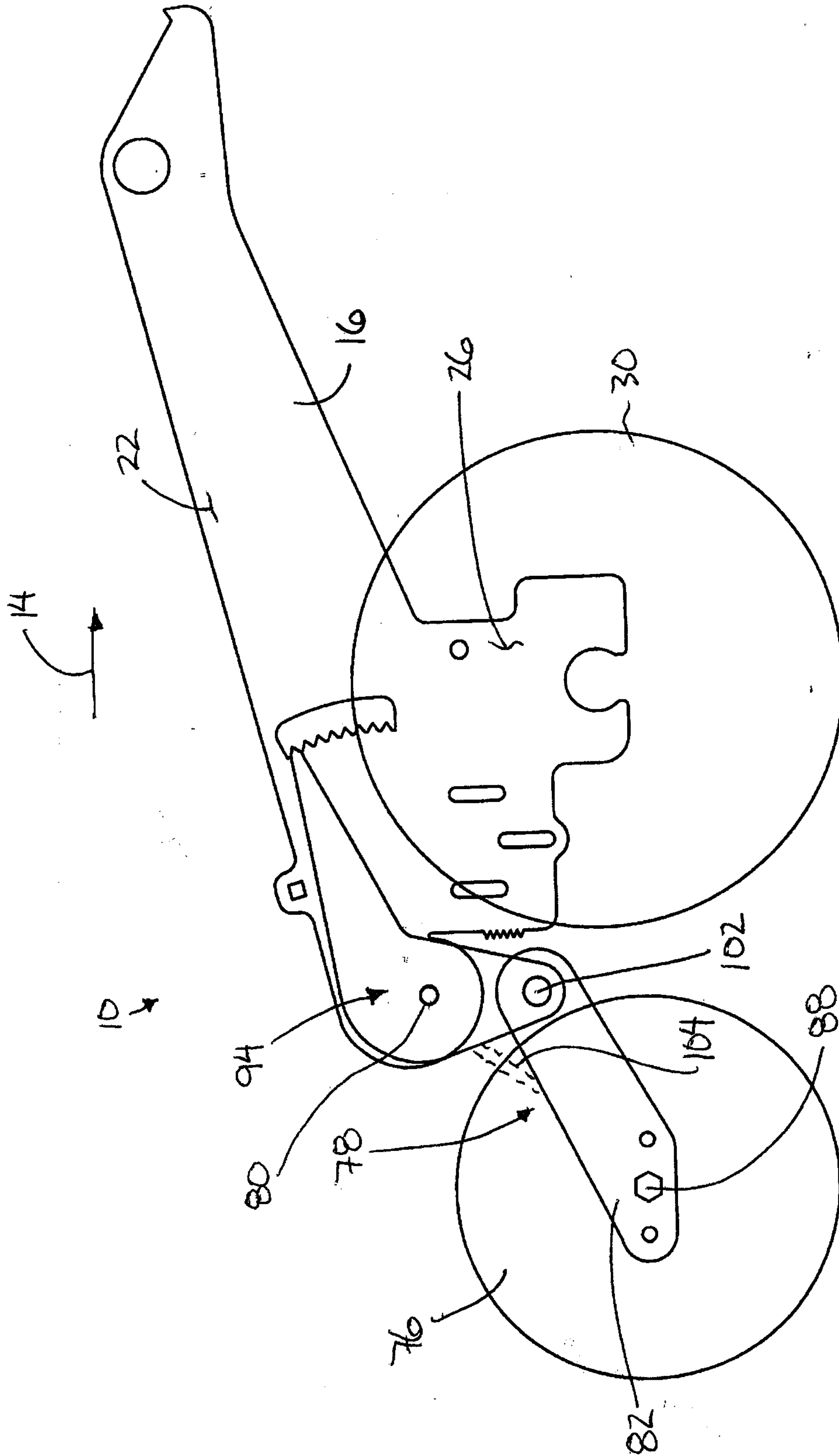


FIGURE 11

