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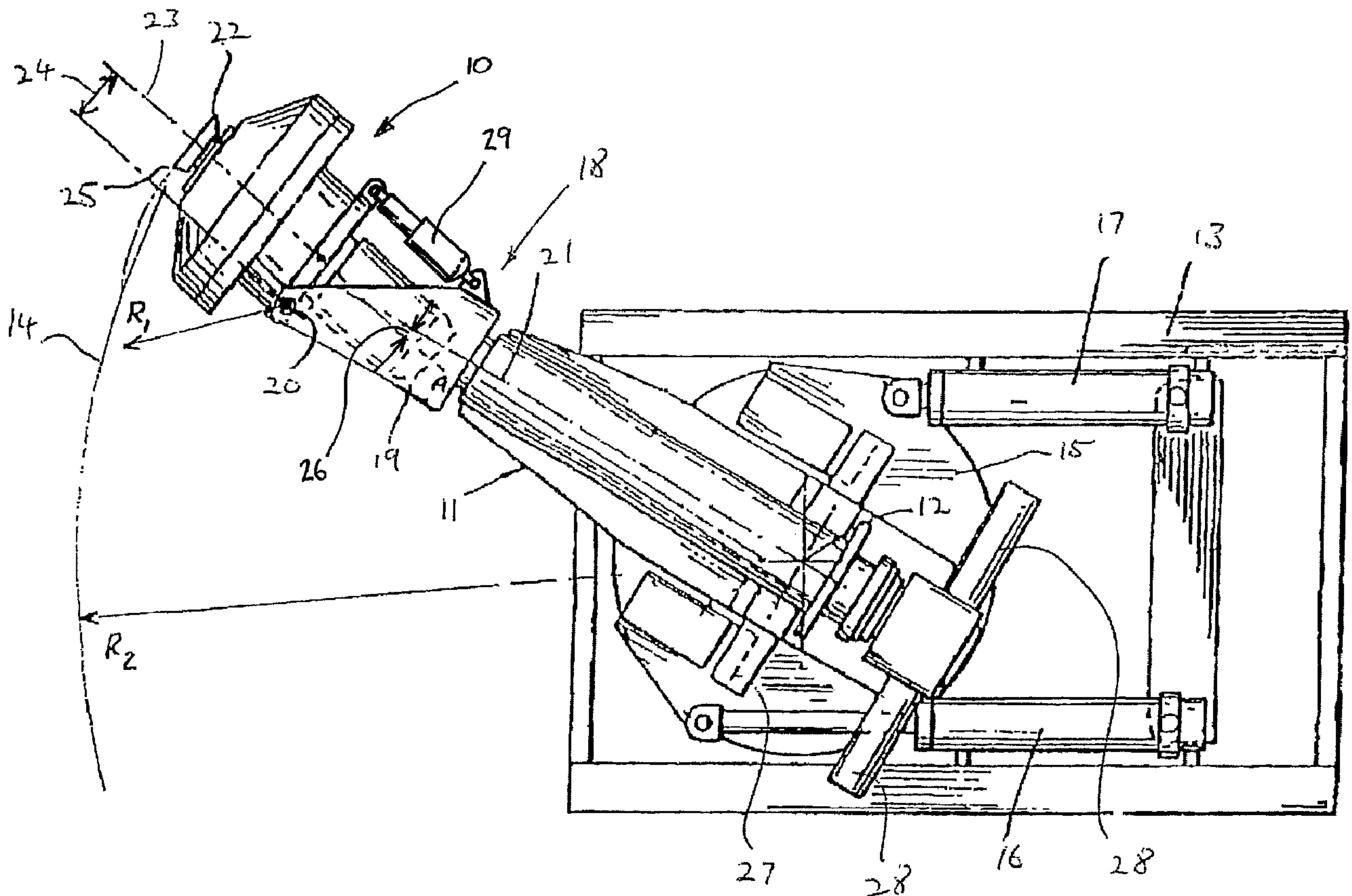
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(54) Title: ROCK CUTTING MACHINE



(57) **Abrégé/Abstract:**

A rock cutting machine including a boom (11) rotatably mounted at a proximal end to a chassis (13) adapted to be placed adjacent a rock face (14) to be cut. The boom extends from the chassis to a distal end adjacent the rock face. A longitudinal boom axis (21) extends between the proximal and the distal ends of the boom and a cutting device (10) is pivotally mounted about a pivot axis (20)

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adjacent the distal end of the boom. The pivot axis enables wrist movement about the pivot axis by a drive mechanism (29) and is offset from the longitudinal axis of the cutting device (23).

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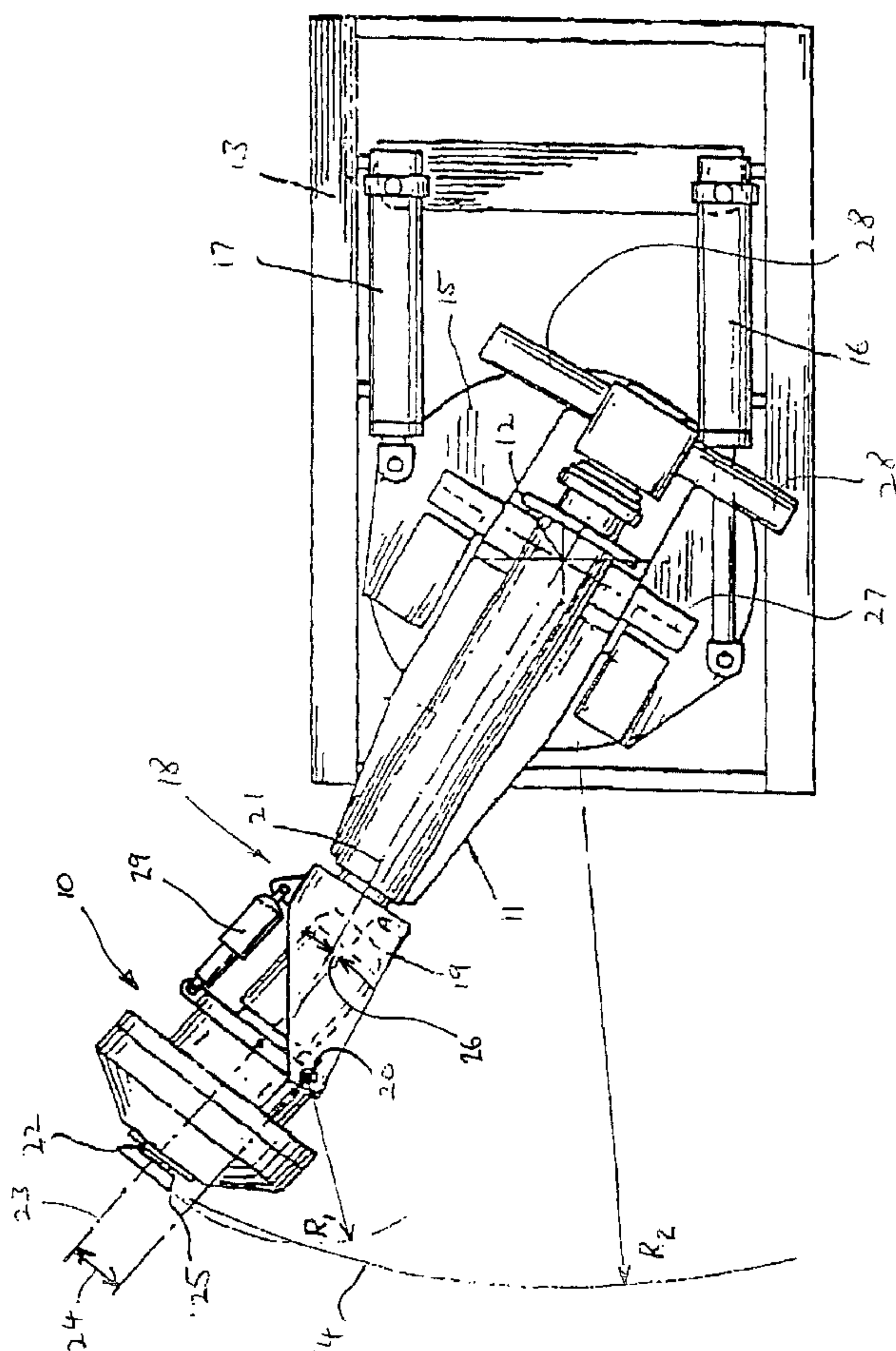
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(54) Title: ROCK CUTTING MACHINE



(57) Abstract: A rock cutting machine including a boom (11) rotatably mounted at a proximal end to a chassis (13) adapted to be placed adjacent a rock face (14) to be cut. The boom extends from the chassis to a distal end adjacent the rock face. A longitudinal boom axis (21) extends between the proximal and the distal ends of the boom and a cutting device (10) is pivotally mounted about a pivot axis (20) adjacent the distal end of the boom. The pivot axis enables wrist movement about the pivot axis by a drive mechanism (29) and is offset from the longitudinal axis of the cutting device (23).

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TITLE: ROCK CUTTING MACHINE**FIELD OF THE INVENTION**

5 This invention relates to a rock cutting machine and has been devised particularly, though not solely for mining rock faces.

BACKGROUND OF THE INVENTION

This invention is a development of the oscillating disc cutter constructions described in published international patent applications WO 03/089761 A1 and WO 03/089762 A1.

10 It is desirable to provide an oscillating disc cutter, which has advantages over previously known roller cutters for all of the reasons mentioned in the aforementioned international patent applications specifications, which is also economical to operate due to factors such as reduced power consumption or reduced wear on the cutter disc.

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

SUMMARY OF THE INVENTION

15 The present invention therefore provides a rock cutting machine including:

a boom rotatably mounted at a proximal end to a chassis adapted to be placed adjacent a rock face to be cut such that the boom extends from the chassis to a distal end adjacent the rock face, the boom having a longitudinal boom axis extending between the proximal and the distal ends, and

20 a cutting device including:

an oscillating disc cutter having a cutting disc configured for oscillation about an axis of oscillation and;

a longitudinal axis collinear with the axis of oscillation of the disc,

25 wherein said device is pivotally mounted to the boom about a pivot axis at or adjacent the distal end of the boom and caused to pivot in use about the pivot axis by a drive mechanism,

the pivot axis being offset from the longitudinal axis of the cutting device.

30 Preferably, the pivot axis is offset from the longitudinal axis of the cutting device by a distance sufficient to cause the cutting disc on the oscillating disc cutter to withdraw slightly from the rock face in use during pivoting of the oscillating disc cutter about the pivot axis.

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Preferably, the longitudinal axis of the cutting device is adjustable with respect to the pivot axis.

5 Preferably, the longitudinal axis of the cutting device is laterally adjustable from a position on a first side of the pivot axis to a position on an opposing side of the pivot axis.

Preferably, the boom is rotatably mounted to the chassis about mutually orthogonal rotation axes.

10 Preferably, the rotation axes are vertical and horizontal when the chassis is on a level surface.

Preferably, the boom is also rotatable about the longitudinal boom axis, allowing the orientation of the offset to be altered in use relative to the rock face.

BRIEF DESCRIPTION OF THE DRAWINGS

15 A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig 1 is a plan view of a rock cutting machine according to the invention;

Fig 2 is a plan view of an alternative embodiment of a rock cutting machine according to the invention; and

Fig 3 is another plan view of the embodiment shown in Fig. 2.

DETAILED DESCRIPTION OF THE INVENTION

20 Referring to the drawings, a cutting device 10 of the type generally described in international patent application WO 03/089761 A1 is mounted on a boom 11 which in turn is rotatably mounted about a vertical rotation axis 12 to a chassis 13 adapted to be placed adjacent a rock face 14 to be cut. The boom 11 is typically mounted on a
25 turntable 15 and rotated about the vertical rotation axis 12 by operation of piston and cylinder assemblies 16 and 17.

The boom is also rotatable about a horizontal axis 27 to control the elevation of the cutting device 10, and is rotatable about the longitudinal axis 21 of the boom by piston and cylinder assemblies 28.

30 The distal end 18 of the boom 11 is provided with a mounting yolk 19 incorporating bearings arranged to rotatably support a mounting pin or the like and forming a pivot axis 20 about which the cutting device 10 can pivot relative to the longitudinal axis 21 of the boom 11.

The cutting device 10 has a cutting disc 22 engageable with the rock face 14 and

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has an axis 23 about which the cutting disc oscillates. Although the cutting device 10 is of the type generally described in WO 03/089761 A1, it will be appreciated that various types of similar cutting devices may be used, with or without the nutating feature described in that patent specification.

The pivot axis 20 is offset from the axis 23 by a distance 24. With this arrangement, the edge 25 of the disc cutter 22 that is actively engaging the rock face 14 is pivoting about the pivot axis 20 at a radius R1. The forces acting on the leading edge 25 of the cutter 22, have components both parallel to axis 23 and perpendicular thereto, tending to cause the angle 26 between the axis 23 of the cutter shaft and the longitudinal axis 21 of the boom 11, to increase.

These forces are typically reacted by one or more hydraulic cylinders 29. The hydraulic cylinders also provide for actuation of the cutter about the pivot axis 20. As a result of the offset of pivot axis 20 from cutting disc axis 23, the effect of any increase in angle 26 is to cause the cutter to withdraw slightly from the face 14 and thereby to relieve the forces acting, when hard material is encountered.

The offset also results in a change of the angle of the cutting edge of cutting disc 22 relative to the face 14 which has the effect of preserving the sharpness of the cutting edge.

By rotating the boom about longitudinal axis 21 by operation of piston and cylinder devices 28, the effect of the offset may be realised in any desired plane of operation, allowing the aforesaid benefits to be optimised and controlled for various operating sweeps of the boom about either the vertical axis of rotation 12 or the horizontal axis of rotation 27, or combinations of both.

A modification to the invention is shown in Figure 2 in which like numbers refer to like parts as shown in the preceding description of Figure 1. In this embodiment, the cutting device is laterally movable, with respect to the arm axis 21 and yolk 19. In this way, the offset of the pivot axis 21 is achieved with a 19 is symmetrical mounting yolk in comparison to that shown in Figure 1.

The lateral movement may be effected in a number of ways including eccentric cams, sliders or tracks mounted to either the cutting device, the yolk or an intermediate part. Figure 2 shows a hydraulically operated slider 30.

The lateral movement allows the pivot axis 20 to be set on either side of the cutting disc axis, as can be seen by comparing Figures 2 and 3. By positioning the axis

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in the required position, the cutting device may be operated in bi-directional sweeps across the rock face without the need to rotate the entire cutting device around axis 21 as
5 is required with the embodiment shown in Figure 1. Advantageously, this functionality reduces the time between sweeps thereby increasing efficiency.

It will be appreciated that if the pivot axis 20 intersects with the cutter axis 23 (as was previously the case in the construction described in international patent application WO 03/089761 A1), then when operating with the angle 26 close to zero, the
10 radius R1 to the leading edge of the cutter is greater than the radius measured along the axis 23 and so there is a tendency for the leading edge to dig into the rock face resulting in a detrimental effect on the life of the cutter. This disadvantage is obviated by offsetting the pivot axis 20 from the cutter axis 23.

In this manner, the life of the cutting disc is prolonged due to the relief in the
15 forces acting between the cutting disc and the rock face when hard material is encountered.

Although the invention has been described with reference to specific examples it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

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CLAIMS

1. A rock cutting machine including:

5 a boom rotatably mounted at a proximal end to a chassis adapted to be placed adjacent a rock face to be cut such that the boom extends from the chassis to a distal end adjacent the rock face, the boom having a longitudinal boom axis extending between the proximal and the distal ends, and

a cutting device including:

10 an oscillating disc cutter having a cutting disc configured for oscillation about an axis of oscillation and;

a longitudinal axis collinear with the axis of oscillation of the cutting disc,

wherein said device is pivotally mounted to the boom about a pivot axis at or adjacent the distal end of the boom and caused to pivot in use about the pivot axis by a
15 drive mechanism,

the pivot axis being offset from the longitudinal axis of the cutting device.

2. A rock cutting machine according to claim 1 wherein the pivot axis is offset from the longitudinal axis of the cutting device by a distance sufficient to cause the cutting disc on the oscillating disc cutter to withdraw slightly from the rock face in use
20 during pivoting of the oscillating disc cutter about the pivot axis.

3. A rock cutting machine according to any one of claims 1 or 2 wherein the longitudinal axis of the cutting device is adjustable with respect to the pivot axis.

4. A rock cutting machine according to any one of claims 1 to 3 wherein the longitudinal axis of the cutting device is laterally adjustable from a position on a first side
25 of the pivot axis to a position on an opposing side of the pivot axis.

5. A rock cutting machine according to any one of claims 1 to 4 wherein the boom is rotatably mounted to the chassis about mutually orthogonal rotation axes.

6. A rock cutting machine according to claim 5 wherein the rotation axes are vertical and horizontal when the chassis is on a level surface.

30 7. A rock cutting machine according to any one of claims 1 to 6 wherein the boom is also rotatable about the longitudinal boom axis, allowing the orientation of the offset to be altered in use relative to the rock face.

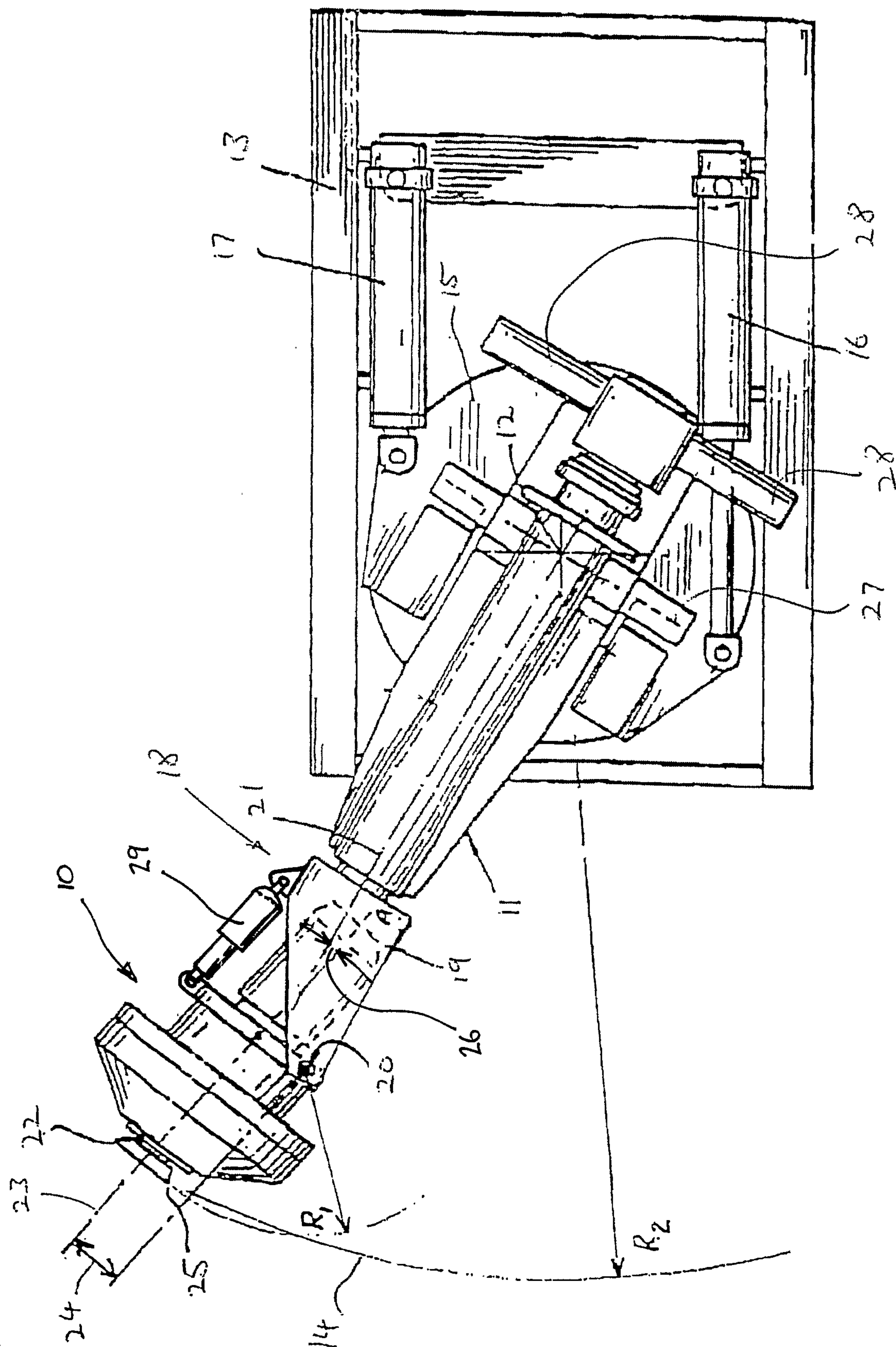


Fig. 1.

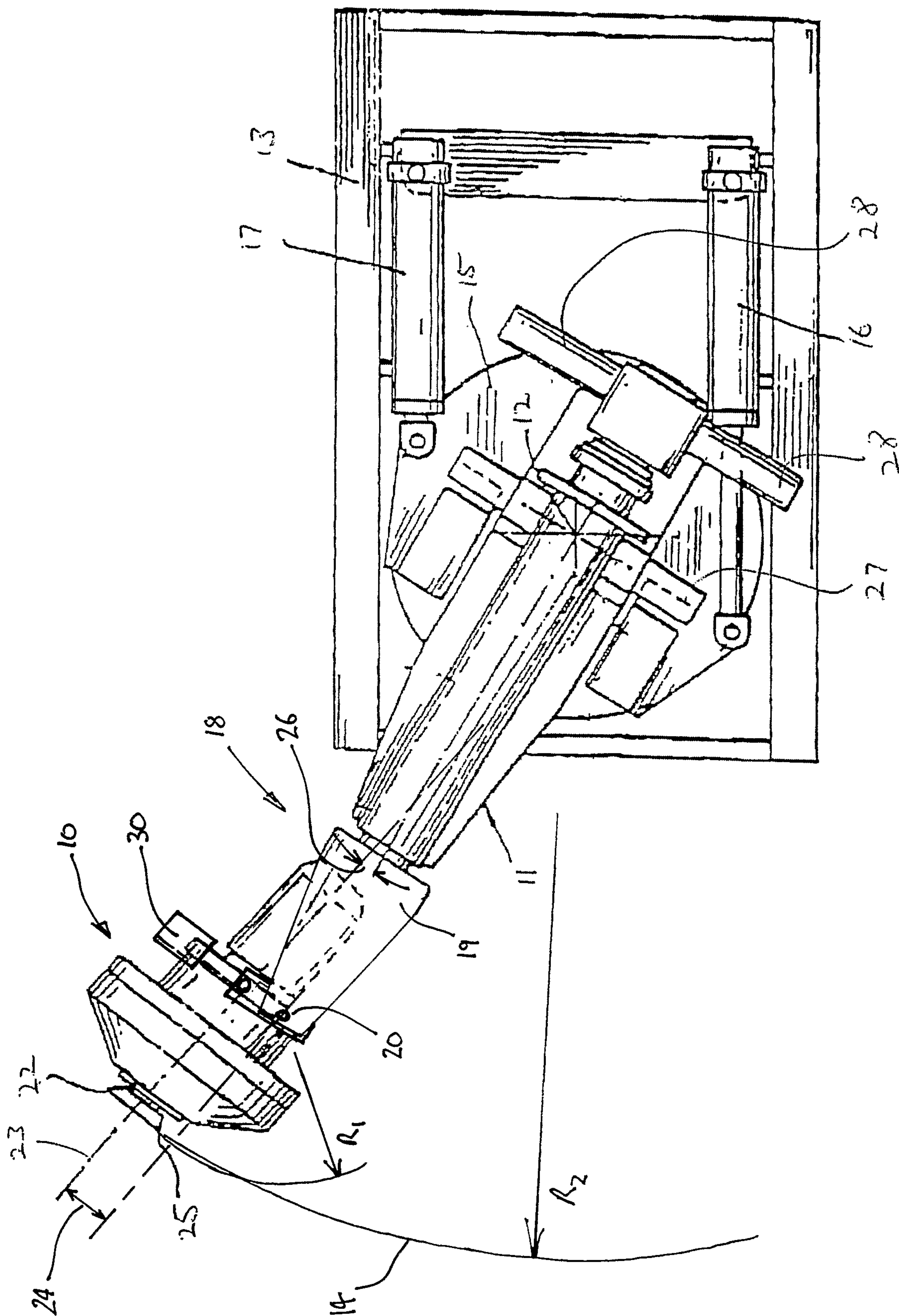


Fig. 2.

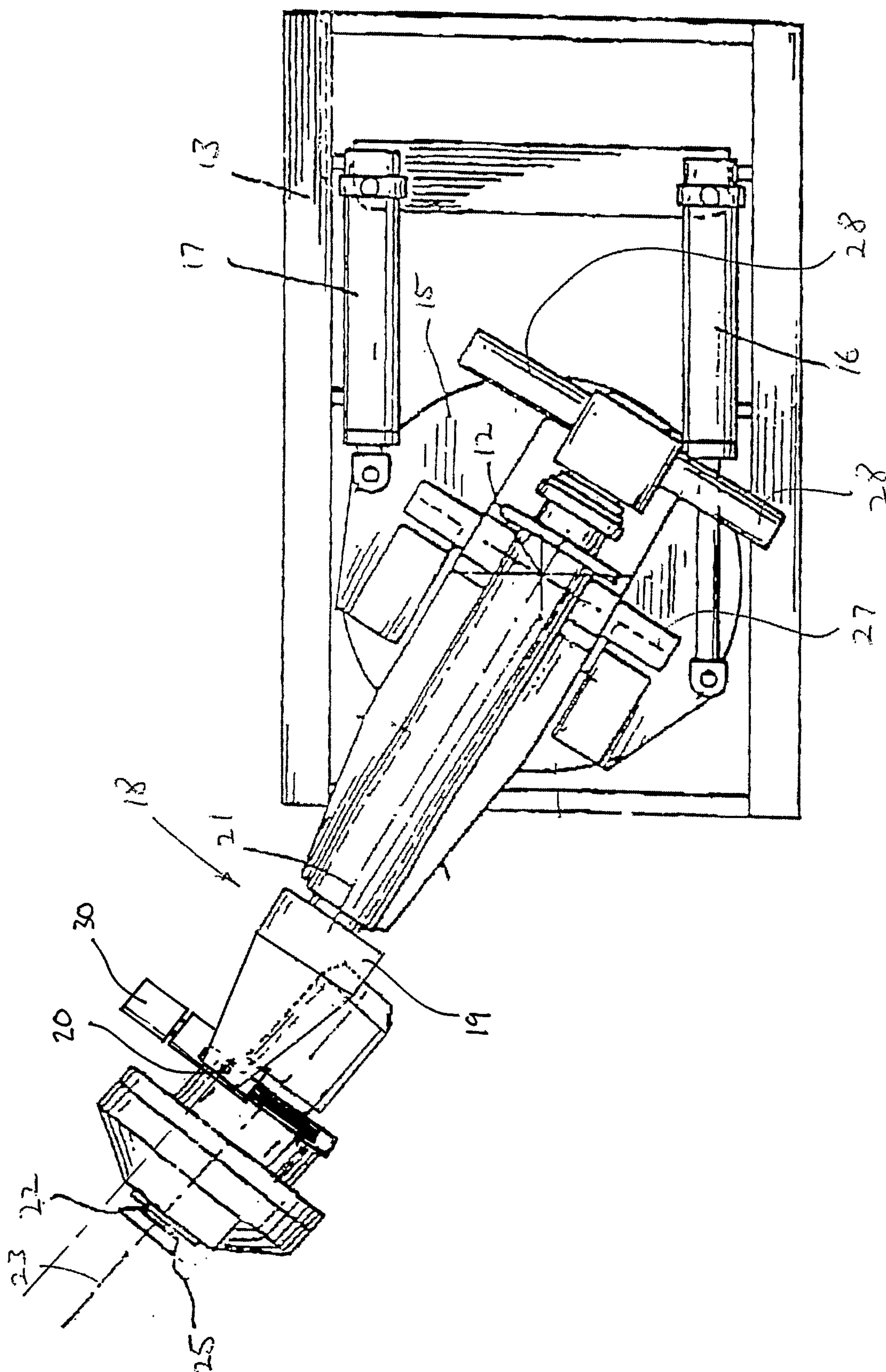


Fig. 3.

