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(54) MACHINE AND METHOD FOR TREATING A SURFACE

OBERFLÄCHENBEARBEITUNGSMASCHINE UND -VERFAHREN

MACHINE ET PROCÉDÉ DE TRAITEMENT D'UNE SURFACE

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Description

Field of the invention

[0001] The invention pertains to a machine and a method of working a surface, for example the removing of a damaged concrete layer with a high-pressure water jet, wherein one uses a carrier, for example a vehicle, having a crosswise feed beam carrying a cart which in turn carries a water nozzle which is adjustable to give an angle of attack in the direction of movement of the cart and at the same time can oscillate in a plane transverse to the feed beam.

Prior art

[0002] According to US 6,877,930 B2 and WO 02/081823, for example, machines of this kind are known. One makes a cutting sweep in one direction and then turns the lance carrying the water nozzle to give an angle of attack in the other direction and makes a return cutting sweep. During the cutting sweeps, the lance oscillates in a plane transverse to the sweep directions to yield a larger working width. Between each cutting sweep or several sweeps, the machine steps forward to achieve a cohesive cutting of equal depth. Such machines are used, e.g., for cutting off the outer layer of concrete on a bridge roadway before pouring a new outer layer. In this way, one exposes the uppermost layer reinforcement, so that fresh concrete is then poured in when pouring the new outer layer.

Purpose and brief description of the invention

[0003] One purpose of the invention is to allow an easy adjustment of the working depth with no risk of uneven working. This is done according to the invention in that the speed and oscillating frequency of the cart are related by a fixed ratio. By setting the speed of the cart, one sets the desired working depth and obtains an evenly worked surface. This is accomplished by the use of a common motor coupled for the oscillation of the water ejecting nozzle and for the propulsion of the cart. The invention is defined by the patent claims.

Brief description of the drawings

[0004]

Figure 1 shows a track-borne machine according to the invention.
Figure 2 shows in perspective view a feed beam from Fig. 1.
Figure 3 is a partial sectional view looking along arrows 3-3 in Fig. 2 of a cart shown in Fig. 2.
Figure 4 is a sketch showing the principle of operation of the cart in Fig. 2 and 3 and the oscillation of a water ejecting lance, also shown in Fig. 2 and 3.

Description of depicted example of the invention.

[0005] **Figure 1** shows a tracked vehicle 11 carrying a feed beam 12 on which a cart 13 runs, carrying a water ejecting lance 14, having a nozzle at its end end and extending through a slot 15 in a protecting shield 16. The back end of the water ejecting lance is connected by high-pressure hose to an assembly with a motor-driven high-pressure water pump. This pump assembly can be mounted in a container placed at a distance from the vehicle 11.

[0006] **Figure 2** shows the feed beam 12. The cart 13 runs on two guides 17,18 and the water ejecting lance 14 is secured to a holder 19 on the cart. The cart is driven by a motor 20 along a rack 21 on the feed beam 12 and the water ejecting lance 14 with its nozzle 22 is fastened to the cover of the cart.

[0007] **Figure 3** shows the feed beam 12 with its two tubelike guides 17,18 and the cart 13 running on the guides. The cart has a pinion 23 engaging with a rack 21 on the feed beam to drive the cart along the guides. The lance holder 19 is fastened by hinges 25 at its rear end and the lance 14 with its nozzle 22 is pivotally fastened to this holder 19 by a turnable bracket 24 on a rotary axle 26 so that the lance can be given an angle of attack in both directions. The angle of attack is advisedly adjusted with a hydraulic cylinder or the like, not shown. The lance holder 19 with the lance has a bracket 27 with an oval hole 28 in which an eccentric 29 rotates so that the lance holder will oscillate about its hinge pivot and thus oscillate the lance in a plane transverse to the feed beam.

[0008] **Figure 4** is a principal diagram showing the arrangements for the cart's 13 movement along the feed beam 12 and the lance's 14 oscillation in a plane transverse to the feed direction. The option of adjusting the angle of attack is not shown in this diagram. The eccentric 29 is mounted on an axle 30 of the motor 20 and oscillates the lance 14, in this case shown in principle via a link 32 corresponding to the bracket 27 with the oval hole 28. The motor's axle 30 has a worm screw 33 engaging with a worm gear 34 and the axle 35 of this worm gear has the pinion 23 engaging with the feed beam's rack 21. The motor thus drives the feed movement via a worm transmission 33,34.

[0009] The motor drives the cart along the feed beam and the oscillation of the lance in a fixed ratio. The oscillation will thus follow a particular sine curve along the surface being worked, regardless of the speed of the cart 13 along the feed beam. By changing the rate of feed, one can change the working depth, since a lower speed gives a greater working depth. Since the speed of oscillation is changed at the same time, one always gets an even working of the surface regardless of the working depth. By replacing the eccentric or otherwise changing the eccentric's spacing, one can change the working width. The wavelength remains the same, but the working depth decreases at the same time as the working width increases.

[0010] The machine of the invention is described as built on a carrier in the form of a vehicle which steps forward between cutting sweeps and is used to cut off the surface layer of concrete, e.g., of a bridge roadway. The invention can be used in other ways, such as a feed beam of the described kind can be mounted on a carrier which can be in the form of a scaffold on a concrete column to work the surface of the concrete column and step forward along the scaffold. The invention can also be used for lighter treatment, e.g. for removing plaster or paint on the body of a building.

Claims

1. Machine for the working of a surface, for example the removing of a damaged concrete layer, with a high-pressure water jet, comprising a carrier (11), for example a vehicle, which has a crosswise feed beam (12) carrying a cart (13) running on the feed beam, the cart carrying a water ejecting nozzle (22) which is adjustable to give an angle of attack in the direction of movement of the cart and at the same time can oscillate in a plane transverse to the feed beam,
characterised by
a common motor (20) for the oscillation of the water ejecting nozzle (22) and for the propulsion of the cart (13) thereby coupling the frequency of oscillation of the water ejecting nozzle (22) in a fixed ratio to the speed of the cart (13).

2. Machine according to claim 1, **characterised in that** the motor (20) drives a worm transmission (33,34) coupled to a pinion engaging with a rack (21) on the feed beam (12) for the driving of the cart (13).

3. Machine according to claim 1 or 2, **characterised in that** the water ejecting nozzle (22) is mounted on a hinged carrier (19) oscillated by an eccentric (29).

4. Machine according to claim 3, **characterised in that** the worm transmission's worm screw (33) driven by the motor (20) has an extension carrying the eccentric (29).

5. Machine according one of the preceding claims, **characterised in that** the water ejecting nozzle (22) is mounted on one end of a lance (14) whose other end is connected to a high-pressure water hose.

6. Method of working a surface, for example the removing of a damaged concrete layer, with a high-pressure water jet, wherein one uses a carrier (11), for example a vehicle, having a crosswise feed beam (12) carrying a cart (13) running thereon,which in turn carries a water nozzle (22) which is adjustable to give an angle of attack in the direction of movement of the cart and at the same time can oscillate in a plane transverse to the feed beam, **characterised in that** one holds the speed of the cart (13) and the oscillating frequency of the water nozzle (22) in a fixed ratio regardless of the speed of the cart.

Patentansprüche

1. Maschine zur Bearbeitung einer Fläche, beispielsweise zum Entfernen einer beschädigten Betonschicht, mit einem Hochdruck-Wasserstrahl, umfassend einen Träger (11), beispielsweise ein Fahrzeug, das einen quer verlaufenden Zuführungsbalken (12) aufweist, der einen Wagen (13) trägt, der auf dem Zuführungsbalken läuft, wobei der Wagen eine Wasserstrahldüse (22) trägt, die einstellbar ist, damit sich ein Arbeitswinkel in der Bewegungsrichtung des Wagens ergibt, und sich gleichzeitig in einer Ebene quer zum Zuführungsbalken hin- und herbewegen kann,
gekennzeichnet durch
einen gemeinsamen Motor (20) für die Hin- und Herbewegung der Wasserstrahldüse (22) sowie für den Vortrieb des Wagens (13), wodurch die Frequenz der Hin- und Herbewegung der Wasserstrahldüse (22) in einem festen Verhältnis zur Geschwindigkeit des Wagens (13) gekoppelt ist.

2. Maschine nach Anspruch 1, **dadurch gekennzeichnet, dass** der Motor (20) ein Schneckengetriebe (33, 34) antreibt, das mit einem Ritzel gekoppelt ist, das mit einer Zahnstange (21) an dem Zuführungsbalken (12) in Eingriff steht, damit der Wagen (13) angetrieben wird.

3. Maschine nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Wasserstrahldüse (22) an einem gelenkig befestigten Träger (19) montiert ist, der von einem Exzenter (29) hin- und herbewegt wird.

4. Maschine nach Anspruch 3, **dadurch gekennzeichnet, dass** die Schnecke (33) des Schneckengetriebes, die von dem Motor (20) angetrieben wird, eine Verlängerung aufweist, die den Exzenter (29) trägt.

5. Maschine nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Wasserstrahldüse (22) an einem Ende einer Lanze (14) montiert ist, deren anderes Ende mit einem Hochdruckwasserschlauch verbunden ist.

6. Verfahren zum Bearbeiten einer Fläche, beispielsweise zum Entfernen einer beschädigten Betonschicht, mit einem Hochdruck-Wasserstrahl, wobei ein Träger (11), beispielsweise ein Fahrzeug, verwendet wird, das einen quer verlaufenden Zufüh-

rungsbalken (12) aufweist, der einen Wagen (13)) trägt, der darauf läuft und wiederum eine Wasserdüse (22) trägt, die einstellbar ist, damit sich ein Arbeitswinkel in der Bewegungsrichtung des Wagens ergibt, und sich gleichzeitig in einer Ebene quer zum Zuführungsbalken hin- und herbewegen kann, **dadurch gekennzeichnet, dass** die Geschwindigkeit des Wagens (13) und die Frequenz der Hin- und Herbewegung der Wasserdüse (22) unabhängig von der Geschwindigkeit des Wagens in einem festen Verhältnis gehalten werden.

un support (11) est utilisé, par exemple un véhicule, comportant une poutre d'alimentation transversale (12) supportant un chariot (13) roulant sur celle-ci, qui supporte lui-même une buse d'eau (22) réglable pour fournir un angle d'attaque dans la direction de mouvement du chariot et pouvant en même temps osciller dans un plan transversal à la poutre d'alimentation, **caractérisé en ce que** la vitesse du chariot (13) et la fréquence d'oscillation de la buse d'eau (22) sont maintenues dans un rapport fixe, quelle que soit la vitesse du chariot.

Revendications

1. Machine destinée à travailler une surface, par exemple en retirant une couche de béton endommagée, avec un jet d'eau à haute pression, comprenant un support (11), par exemple un véhicule, comportant une poutre d'alimentation transversale (12) supportant un chariot (13) roulant sur la poutre d'alimentation, le chariot supportant une buse d'éjection d'eau (22) réglable pour fournir un angle d'attaque dans la direction de mouvement du chariot et pouvant en même temps osciller dans un plan transversal à la poutre d'alimentation,
   caractérisée par
   un moteur commun (20) pour l'oscillation de la buse d'éjection d'eau (22) et pour la propulsion du chariot (13), couplant ainsi la fréquence d'oscillation de la buse d'éjection d'eau (22) selon un rapport fixe à la vitesse du chariot (13).

2. Machine selon la revendication 1, **caractérisée en ce que** le moteur (20) entraîne une transmission à vis sans fin (33, 34) couplée à un pignon qui s'accouple à une crémaillère (21) sur la poutre d'alimentation (12) pour l'entraînement du chariot (13).

3. Machine selon la revendication 1 ou 2, **caractérisée en ce que** la buse d'éjection d'eau (22) est montée sur un support articulé (19) mis en oscillation par un excentrique (29).

4. Machine selon la revendication 3, **caractérisée en ce que** la vis sans fin de la transmission à vis sans fin (33) entraînée par le moteur (20) comporte une extension supportant l'excentrique (29).

5. Machine selon l'une des revendications précédentes, **caractérisée en ce que** la buse d'éjection d'eau (22) est montée sur une extrémité d'une lance (14) dont l'autre extrémité est raccordée à un tuyau d'eau à haute pression.

6. Procédé permettant de travailler une surface, par exemple en retirant une couche de béton endommagée avec un jet d'eau à haute pression, dans lequel

Fig 1

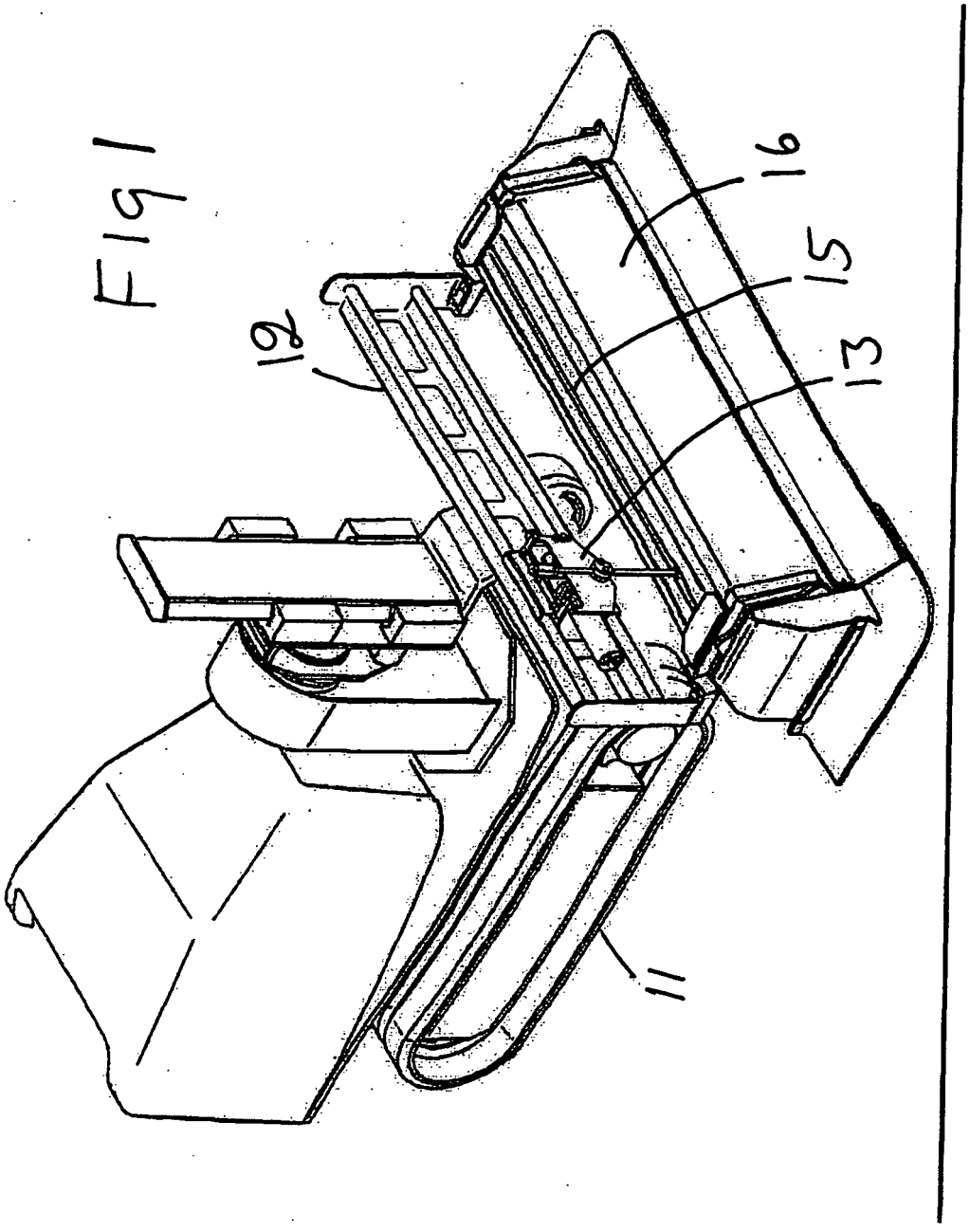


FIG 2

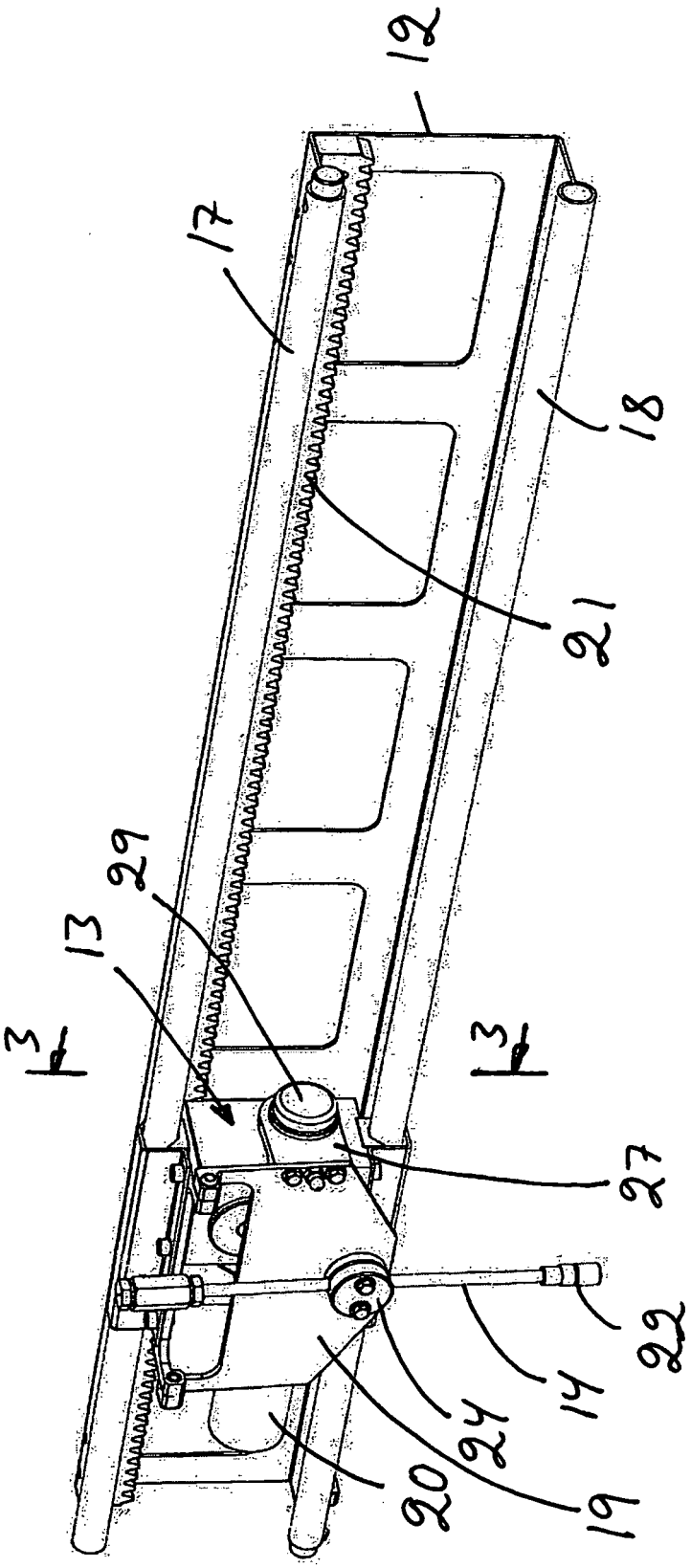


FIG 3

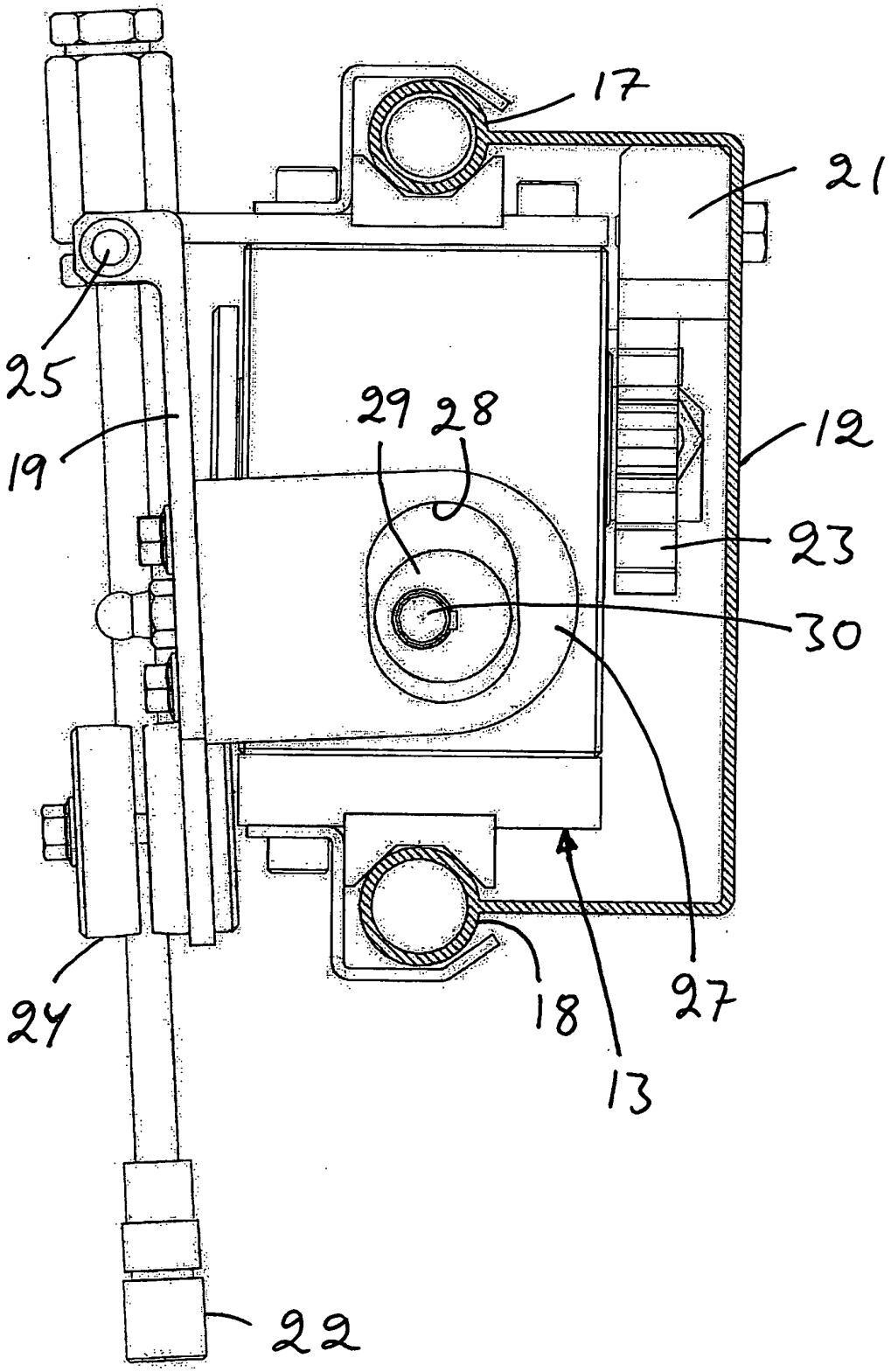
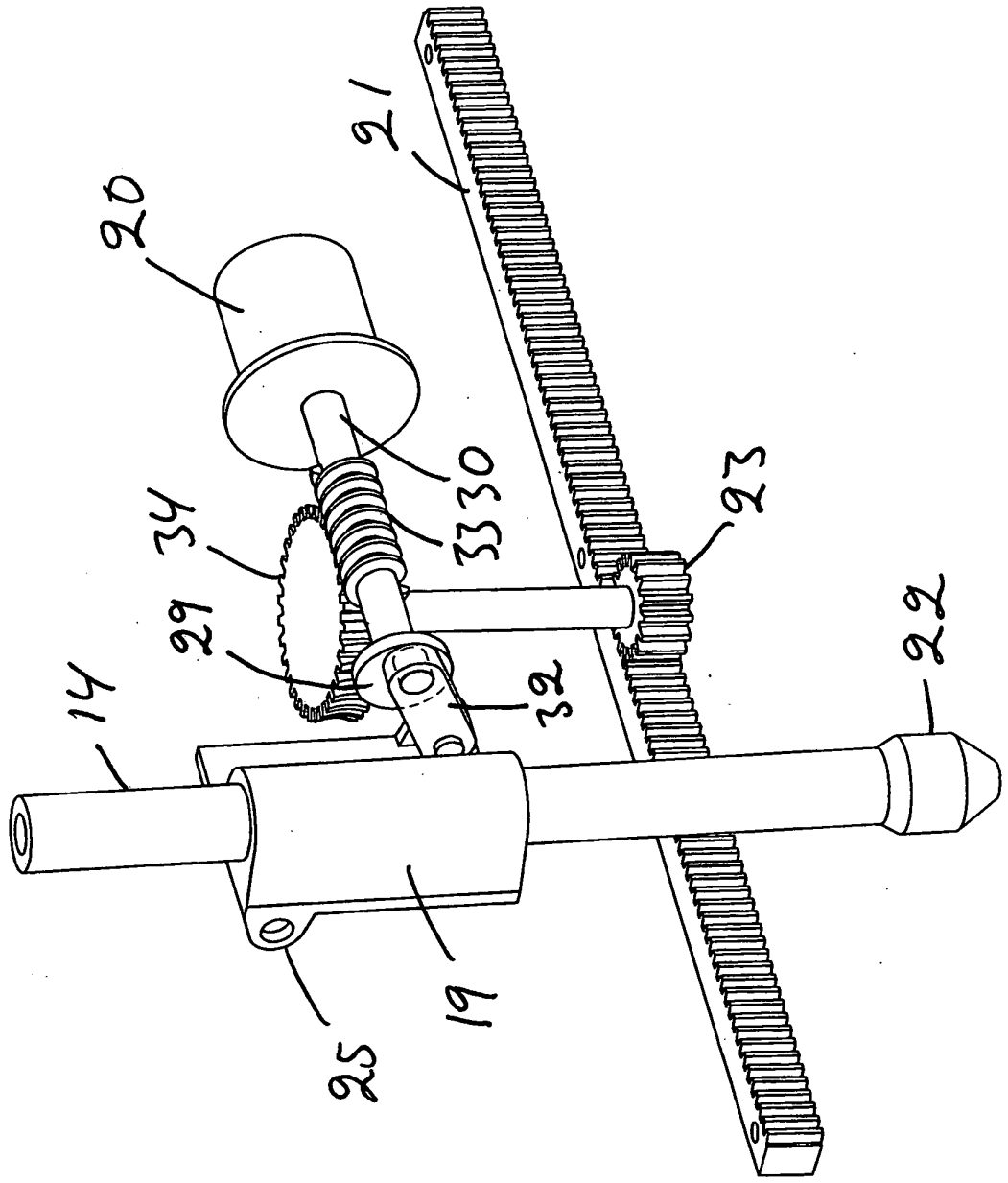


FIG 4



REFERENCES CITED IN THE DESCRIPTION

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