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(54) **Improvements relating to de- and re-crating machines.**

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Description

This invention relates to de- and re-crating machines and, more particularly, is concerned with a drive mechanism in such a machine for actuating a translating bar whose function is to translate a plurality of containers, e.g. bottles, into or out of a crate.

Conventional de- and re-crating machines employ drive mechanisms which generally use chains and which require the use of a pantagraph in order to maintain the translating bars in a horizontal condition at all points of its arc of movement. This fixed horizontal orientation is required in order to ensure that bottles being transported by the translating bars are themselves maintained in a vertical orientation regardless of their location at any given instant.

DE-A-3328112 describes a de- and re-crating machine employing a four-bar mechanism for driving the translating bar.

According to one aspect of the present invention, there is provided a drive arrangement for a de- and re-crating machine, which comprises a crank plate including a crank arm and which in use is mounted in the frame of said machine for rotation about a fixed axis; a coupler arm pivotally connected at a point intermediate its ends to said crank arm; a rocker arm one end of which is pivotally connected to one end of said coupler arm and the other end of which in use is mounted for pivotal movement to a fixed point on the frame of said machine; a link arm one end of which is pivotally mounted at the end of said crank arm; and a translating bar the outboard end of which is adapted to carry means for supporting a plurality of containers and the inboard end of which is pivotally connected to that end of said coupler arm remote from the pivotal connection between the coupler arm and the rocker arm, and the translating bar also being pivotally connected at a point intermediate its ends to one end of said link arm, whereby rotation of said crank plate causes the crank arm, rocker arm, coupler arm and link arm to co-operate to cause the translating bar to move in a predetermined path while maintaining the translating bar in a fixed orientation.

The linkage between the crank plate and the translating bar is a four bar mechanism which is able to articulate freely. The fixed pivot points are represented by the centre of the crank plate and by one end of the rocker arm. The crank plate is preferably arranged to be driven through a maximum rotation of 220°. With such an arrangement, arcuate reciprocation of the crank plate results in a movement of the translating bar which has three components, the first component being a relatively long vertical upward movement; the second component being an arcuate movement in a vertical plane; and the third component being a relatively short vertical downward movement. Throughout this sequence of movements, the translating bar remains in a fixed, substantially horizontal orientation. Continued movement of the connecting rod reverses this sequence of movements of the translating bar.

Preferably, the drive arrangement is mounted in a machine frame which also includes a source of motive power and a mechanism for coupling the power source to the crank plate. Advantageously, such a mechanism includes a quadrant gear coupled to said crank plate by, for example, a spur gear; and a connecting rod driven by a crank on the output shaft of the motor and connected so as to cause arcuate reciprocation of the quadrant gear.

According to another aspect of the present invention, there is provided a de- and re-crating machine, which comprises a machine frame; a motor mounted in said machine frame and having an output shaft on which there is mounted a crank; a quadrant gear mounted for rotation about a fixed axis in said machine frame and connected to said crank by a connecting rod; a crank plate mounted for rotation about a fixed axis in said machine frame and including a crank arm, driven by said quadrant gear; a coupler arm pivotally connected at a point intermediate its ends to said crank arm; a rocker arm one end of which is pivotally connected to one end of said coupler arm and the other end of which is mounted for pivotal movement about a fixed point on said machine frame; a link arm one end of which is pivotally mounted at the end of said crank arm; and a translating bar the outboard end of which is adapted to carry means for supporting a plurality of containers and the inboard end of which is pivotally connected to that end of said coupler arm remote from the pivotal connection between the coupler arm and the rocker arm, and the translating bar also being pivotally connected at a point intermediate its ends to one end of said link arm, whereby rotation of said motor causes reciprocation of said connecting rod which in turn causes arcuate movement of said quadrant gear, thereby driving said crank plate so that the crank arm, rocker arm, coupler arm and link arm co-operate to cause the translating bar to move in a predetermined path while maintaining the translating bar in a fixed orientation.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, which show schematic sectional views of a machine in accordance with this invention in the plane of movement of the translating bar.

Referring now to the drawings, Figure I shows the drive mechanism holding the translating bar in a first position at which it is about to deliver a plurality of bottles to a crate, and Figure 2 shows the drive mechanism in a second position in which the translating bar is about to collect a plurality of bottles from a marshalling table.

As shown in the drawings, the apparatus comprises a frame I which supports a marshalling table 2 over which is positioned an endless conveyor 3,4 the upper belt run 3 of which is shown carrying a plurality of bottles 5. Also mounted on frame 1 is an electric motor and gear box 6 the output shaft of which includes an eccentric drive pin 7 which forms part of a crank arrangement 8. A connecting rod 9 is pivotally mounted at one end of crank 8. The remote end of connecting rod 9 is pivotally mounted at 10 to a quadrant gear 11 which rotates about a fixed pivot 12 in the frame 1. In the illustrated embodiment, quadrant wheel 11 moves through an arc of 81° 44 minutes. An arcuate portion 13 of quadrant gear 11 is provided with gear teeth and contacts a spur gear 14 which is pivotally mounted about an axis 15 which is fixed with respect to frame 1. In front of spur wheel 14, and mounted about the same axis, is a crank plate 16 which is arranged to rotate with spur gear 14. Crank plate 16 includes a crank arm 17 which is pivotally connected at 18 to a link arm 19 and is also pivotally connected at 20 to a coupler arm 21. That end of link arm 19 opposite to pivotal connection 18 is pivotally connected at 22 to a translating bar 23. The inboard end of translating bar 23 is pivotally connected at 24 to one end of coupler arm 21. The other end of coupler arm 21 is pivotally connected at 25 to a rocker arm 26; that end of rocker arm 26 opposite pivot 25 is pivotally mounted at 27 on a pivot axis which is fixed with respect to frame 1. Translating bar 23 is thus held by a four bar linkage made up of crank arm 17, link arm 19, coupler arm 21 and rocker arm 26. These four arms are linked to articulate freely with one another through pivotal connections 18, 20, 22, 24, 25 and 27. Pivot points 12, 15 and 27 are fixed with respect to frame 1. The outboard end 28 of translating bar 23 carries a beam (not shown) which in turn supports the grab heads (not shown) which serve either to take bottles out of, or place bottles into, crates such as that shown at 29. These crates are supported on a crate conveyor 30.

The gear ratio between rim portion 13 of quadrant gear 11 and spur gear 14 (which is fixed with respect to crank plate 16) is approximately 13:35, so that the maximum arcuate movement of quadrant gear 11 is able to effect a maximum arcuate movement in crank plate 16 of 220°. When the drive system is at one extreme of its motion (as shown in Figure 1, with connecting rod 9 and crank 8 at their lowermost position), translating bar 23 is positioned so that the grab heads (not shown) supported by outboard end 28 are located directly above the longitudinal axis of crate conveyor 30. The vertical spacing between crate conveyor 30 and translating bar 23 is arranged so that, in the configuration shown in Figure 1, bottles held in the grab heads are substantially within the confines of crate 29. Thus release of the bottles from the grab heads serves to position the bottles within crate 29.

As crank arrangement 8 rotates to push connecting rod 9 upwardly, quadrant gear 11 is caused to rotate counter-clockwise which in turn drives crank plate 16 in a clockwise direction. This in turn causes translating bar 23 to move vertically upwardly from the position shown in Figure 1 and then to follow an arcuate movement as crank arm 17 moves towards a vertical orientation and continues its clockwise movement. After performing an arc of 180°, further rotation of crank plate 16 results in translating bar 23 moving downwardly and vertically by a small distance until connecting rod 9 reaches its maximum upward position which is illustrated in Figure 2. In this configuration, translating bar 23 is positioned so that its grab heads (not shown) are able to cooperate with bottles 5 positioned on the marshalling table 2. In this position, the grab heads are able to clamp about the necks of bottles 5, whereupon further rotation of crank arrangement 8 causes connecting rod 9 to move downwardly, thus lifting translating bar 23 upwardly for a short distance and then in an arc of 180° and thereafter vertically downwardly, until it again reaches the configuration shown in Figure 1.

In practice, the motor 6 will be driven so that eccentric drive pin 7 rotates at a speed of about 12 revolutions per minute. This allows sufficient time for actuation of the grab heads supported by translating bar 23 thus enabling proper transport and transfer of bottles such as 5 to occur.

Claims

1. A drive arrangement for a de- and re-crating machine, which comprises a crank plate (16) including a crank arm (17) and which in use is mounted in the frame (1) of said machine for rotation about a fixed axis (15); a coupler arm (21) pivotally connected at a point (20) intermediate its ends to said crank arm; a rocker arm (26) one end of which is pivotally connected (at (25)) to one end of said coupler arm and the other end of which in use is mounted for pivotal movement to a fixed point (27) on the frame of said machine; a link arm (19) one end of which is pivotally mounted (at (18)) at the end of said crank arm; and a translating bar (23) the outboard end (28) of which is

adapted to carry means for supporting a plurality of containers and the inboard end of which is pivotally connected (at (24)) to that end of said coupler arm remote from the pivotal connection between the coupler arm and the rocker arm, and the translating bar also being pivotally connected at a point (22) intermediate its ends to one end of said link arm, the arrangement being such that rotation of said crank plate (16) causes the crank arm (17), rocker arm (26), coupler arm (21) and link arm (19) to co-operate to cause the translating bar to move in a predetermined path while maintaining the translating bar (23) in a fixed orientation.

2. A drive arrangement as claimed in claim I, wherein said crank plate (16) is arranged to be driven through a maximum rotation of 220°.

3. A drive arrangement as claimed in claim I or 2, wherein the drive arrangement is mounted in a machine frame which also includes a source of motive power (6) and a mechanism (8-12) for coupling the power source to the crank plate.

4. A drive arrangement as claimed in claim 3, wherein said mechanism includes a quadrant gear (11) coupled to said crank plate, and a connecting rod (9) driven by a crank (8) on the output shaft of the motor and connected (at (10)) so as to cause an arcuate reciprocation of the quadrant gear.

5. A de- and re-crating machine, which comprises a machine frame (1); a motor (6) mounted in said machine frame and having an output shaft on which there is mounted a crank (8); a quadrant gear (11) mounted for rotation about a fixed axis (12) in said machine frame and connected to said crank by a connecting rod (9); a crank plate (16) mounted for rotation about a fixed axis (15) in said machine frame and including a crank arm (17), driven by said quadrant gear; a coupler arm (21) pivotally connected at a point (20) intermediate its ends to said crank arm; a rocker arm (26) one end of which is pivotally connected (at (25)) to one end of said coupler arm and the other end of which is mounted for pivotal movement about a fixed point (27) on said machine frame; a link arm (19) one end of which is pivotally (at (18)) mounted at the end of said crank arm; and a translating bar (23) the outboard end (28) of which is adapted to carry means for supporting a plurality of containers and the inboard end of which is pivotally connected (at (24)) to that end of said coupler arm remote from the pivotal connection between the coupler arm and the rocker arm, and the translating bar also being pivotally connected at a point (22) intermediate its ends to one end of said link arm, whereby rotation of said motor (6) causes reciprocation of said connecting rod (9) which in turn causes arcuate movement of said quadrant gear (11), thereby driving said crank plate (16) so that the crank arm (17), rocker arm (26), coupler arm (21) and link arm (19) co-operate to cause the translating (23) bar to move in a predetermined path while maintaining the translating bar in a fixed orientation.

Revendications

1. Une disposition d'entraînement pour une machine d'encaissage et de décaissage, qui comprend un plateau de manivelle (16) comportant un bras de manivelle (17) et qui, en service, est montée dans le bâti (1) de ladite machine pour tourner autour d'un axe fixe (15). un bras connecteur (21) articulé, en un point (20) intermédiaire à ses extrémités, audit bras de manivelle ; un bras de culbuteur (26) dont une extrémité est articulée (en (25)) à une extrémité dudit bras connecteur et dont l'autre extrémité, en service, est montée en vue d'un mouvement de pivotement autour d'un point fixe (27) du bâti de ladite machine ; un bras de liaison (19) dont une extrémité est articulée (en (18)) à l'extrémité dudit bras de manivelle ; et une barre de déplacement en translation (23) dont l'extrémité extérieure (28) est prévue pour porter des moyens permettant de supporter un ensemble de récipients et dont l'extrémité intérieure est articulée (en (24)) à l'extrémité du bras connecteur éloignée de la liaison de pivotement entre le bras connecteur et le bras de culbuteur, la barre de déplacement en translation étant également articulée, en un point (22) intermédiaire à ses extrémités, à une extrémité dudit bras de liaison, la disposition étant telle qu'une rotation dudit plateau de manivelle (16) amène le bras de manivelle (17), le bras de culbuteur (26), le bras connecteur (21) et le bras de liaison (19) à coopérer pour faire déplacer la barre de déplacement en translation dans un trajet déterminé à l'avance tout en maintenant la barre de déplacement en translation (23) dans une orientation fixe.

2. Une disposition d'entraînement comme revendiquée à la revendication 1, dans laquelle ledit plateau de manivelle (16) est prévu pour être entraîné sur une rotation maximale de 220°.

3. Une disposition d'entraînement comme reven-

diquée à la revendication 1 ou 2, dans laquelle la disposition d'entraînement est montée dans un bâti de machine qui comprend également une source d'énergie motrice (6) et un mécanisme (8-12) pour coupler la source d'énergie au plateau de manivelle.

4. Une disposition d'entraînement comme revendiquée à la revendication 3, dans laquelle ledit mécanisme comprend un engrenage en quart de cercle (11) couplé audit plateau de manivelle, et une biellette (9) entraînée par une manivelle (8) montée sur l'arbre de sortie du moteur et reliée (en (10)) de manière à provoquer un mouvement de va-et-vient en arc de cercle de l'engrenage en quart de cercle.

5. Une machine d'encaissage et de décaissage, qui comprend un bâti de machine (1) ; un moteur (6) monté dans ledit bâti de machine et présentant un arbre de sortie sur lequel est montée une manivelle (8) ; un engrenage en quart de cercle (11) monté pour tourner autour d'un axe fixe (12) dans ledit bâti de machine et relié à ladite manivelle par une biellette (9) ; un plateau de manivelle (16) monté pour tourner autour d'un axe fixe (15) dudit bâti de machine et comprenant un bras de manivelle (17) entraîné par ledit engrenage en quart de cercle ; un bras connecteur (21) articulé, en un point (20) intermédiaire à ses extrémités, audit bras de manivelle ; un bras de culbuteur (26) dont une extrémité est articulée (en (25)) à une extrémité dudit bras connecteur et dont l'autre extrémité est montée en vue d'un mouvement de pivotement autour d'un point fixe (27) du bâti de machine ; un bras de liaison (19) dont une extrémité est articulée (en (18)) à l'extrémité dudit bras de manivelle ; et une barre de déplacement en translation (23) dont l'extrémité extérieure (28) est prévue pour porter des moyens permettant de supporter un ensemble de récipients et dont l'extrémité intérieure est articulée (en (24)) à l'extrémité du bras connecteur éloignée de la liaison de pivotement entre le bras connecteur et le bras de culbuteur, la barre de déplacement en translation étant également articulée, en un point (22) intermédiaire à ses extrémités, à une extrémité dudit bras de liaison, de sorte que la rotation dudit moteur (6) provoque un mouvement de va-et-vient de la biellette (9) qui, à son tour, provoque un mouvement en arc de cercle dudit engrenage en quart de cercle (11), en entraînant ainsi ledit plateau de manivelle (16) pour que le bras de manivelle (17), le bras de culbuteur (26), le bras connecteur (21) et le bras de liaison (19) coopèrent pour faire déplacer la barre de déplacement en translation (23) dans un trajet déterminé à l'avance tout en maintenant la barre de déplacement en translation dans une orientation fixe.

Ansprüche

1. Antriebsanordnung für eine Kastenentleerungs- und Kasten-füllmaschine mit einer Kurbelplatte (16), die einen Kurbelarm (17) umfaßt, die bei Gebrauch im Rahmen (1) der Maschine zur Drehung um eine ortsfeste Achse (15) eingebaut ist; einem Koppelarm (21), der an einer zwischen seinen Enden befindlichen Stelle (20) drehbar mit dem Kurbelarm verbunden ist; einem Schwingarm (26), dessen eines Ende (bei (25)) drehbar mit einem Ende des Koppelarms verbunden und dessen anderes Ende bei Gebrauch an einem ortsfesten Punkt (27) am Rahmen der Maschine zur drehbaren Bewegung befestigt ist; einem Verbindungsarm (19), dessen eines Ende (bei (18)) drehbar an dem Ende des Kurbelarms befestigt ist; und einer übertragungsschiene (23), deren entferntes Ende (28) so ausgebildet ist, daß es eine Einrichtung zum Halten mehrerer Behälter trägt, und deren nahes Ende (bei (24)) drehbar mit dem von der Drehverbindung zwischen dem Koppelarm und dem Schwingarm entfernten Ende des Koppelarms verbunden ist, wobei die Übertragungsschiene ferner an einer zwischen ihren Enden befindlichen Stelle (22) drehbar mit einem Ende des Verbindungsarms verbunden ist, wobei die Anordnung derart ausgebildet ist, daß die Drehung der Kurbelplatte (16) bewirkt, daß der Kurbelarm (17), der Schwingarm (26), der Koppelarm (21) und der Verbindungsarm (19) zusammenwirken, um eine Bewegung der Übertragungsschiene entlang einer vorbestimmten Bahn hervorzurufen und gleichzeitig die Übertragungsschiene (23) in einer gleichbleibenden Orientierung zu halten.

2. Antriebsanordnung nach Anspruch 1, in welcher die Kurbelplatte (16) so angeordnet ist, daß sie mit einer maximalen Drehung von 220° angetrieben wird.

3. Antriebsanordnung nach Anspruch 1 oder 2, in welcher die Antriebsanordnung in einem Maschinenrahmen eingebaut ist, der auch eine Antriebskraftquelle (6) und einen Mechanismus (8-12) für die Verbindung der Kraftquelle mit der Kurbelplatte umfaßt.

4. Antriebsanordnung nach Anspruch 3, in welcher der Mechanismus einen mit der Kurbelplatte in Verbindung stehenden Quadrantzahn-

bogen (11) und eine Kurbelstange (9) umfaßt, die durch eine Kurbel (8) an der Abtriebswelle des Motors angetrieben und (bei (10)) angeschlossen ist, um eine kreisbogenförmige Hin- und Herbewegung des Quadrantzahnbogens hervorzurufen.

5. Kastenentleerungs- und Kastenfüllmaschine mit einem Maschinenrahmen (1), einem Motor (6), der in diesem Maschinenrahmen eingebaut ist und eine Abtriebswelle umfaßt, an der eine Kurbel (8) montiert ist; einem Quadrantzahnbogen (11), der zur Drehung um eine ortsfeste Achse (12) im Maschinenrahmen eingebaut und mittels einer Kurbelstange (9) mit der Kurbel verbunden ist; einer durch den Quadrantzahnbogen angetriebenen Kurbelplatte (16), die zur Drehung um eine ortsfeste Achse (15) im Maschinenrahmen eingebaut ist und einen Kurbelarm (7) umfaßt; einem Koppelarm (21), der an einer zwischen seinen Enden befindlichen Stelle (20) drehbar mit dem Kurbelarm verbunden ist; einem Schwingarm (26), dessen eines Ende (bei (25)) drehbar mit einem Ende des Koppelarms verbunden und dessen anderes Ende zur Drehbewegung um einen ortsfesten Punkt (27) am Maschinenrahmen befestigt ist; einem Verbindungsarm (19), dessen eines Ende (bei (18)) drehbar an dem Ende des Kurbelarms befestigt ist; und einer Übertragungsschiene (23), deren entferntes Ende (28) so ausgebildet ist, daß es eine Einrichtung zum Halten mehrerer Behälter trägt, und deren nahes Ende (bei (24)) drehbar mit dem von der Drehverbindung zwischen dem Koppelarm und dem Schwingarm entfernten Ende des Koppelarms verbunden ist, wobei die Übertragungsschiene ferner an einer zwischen ihren Enden befindlichen Stelle (22) drehbar mit einem Ende des Schwingarms verbunden ist, wodurch die Drehung des Motors (6) eine Hin- und Herbewegung der Kurbelstange (9) bewirkt, welche ihrerseits eine kreisbogenförmige Bewegung des Quadrantzahnbogens (11) hervorruft und dadurch die Kurbelplatte (16) antreibt, so daß der Kurbelarm (17), der Schwingarm (26), der Koppelarm (21) und der Verbindungsarm (19) zusammenwirken, um eine Bewegung der Übertragungsschiene (23) entlang einer vorbestimmten Bahn hervorzurufen und gleichzeitig die Übertragungsschiene in einer gleichbleibenden Orientierung zu halten.

Fig.1.

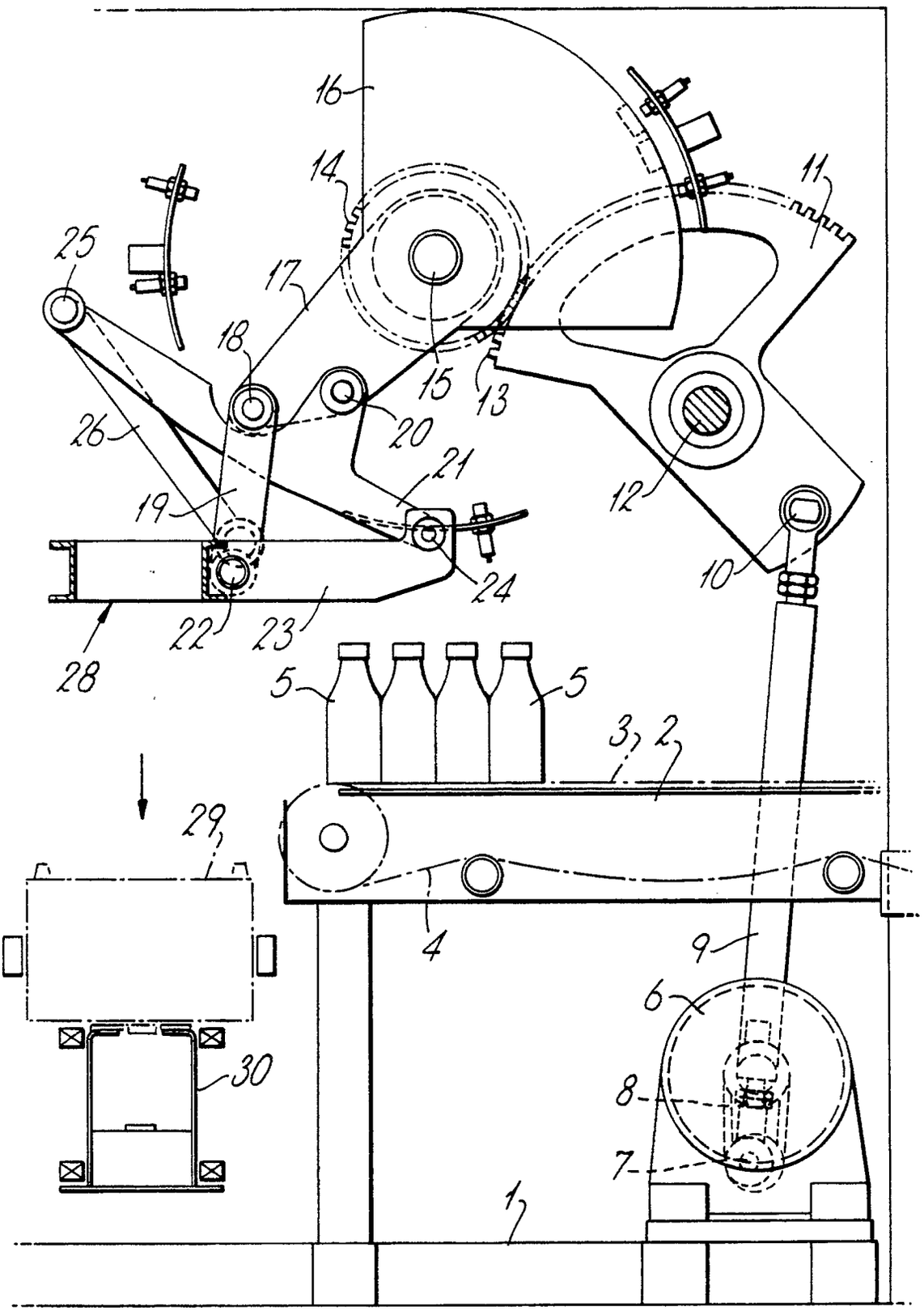
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Fig.2.