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(54) **FEEDER MECHANISM FOR A PACKAGING MACHINE**

ZUFUHRMECHANISMUS FÜR EINE VERPACKUNGSMASCHINE

MECANISME D'ALIMENTATION POUR MACHINE D'EMBALLAGE

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Description

Background of the Invention

[0001] This invention relates to packaging of primary articles such as cans or bottles in cartons and is more particularly concerned with feeding the cartons in collapsed condition from a hopper and for transferring the cartons to an in-feed end of a packaging machine.

[0002] UK Patent GB 2 053 133 to Bosch concerns an apparatus for removing, folding box blanks from a stationary magazine and erecting and transferring the blanks. It comprises transfer suction members which are mounted on four point linkages and arranged on a rotary carrier controlled by cams. During rotation, to facilitate the removal of the blanks a stationary condition of the suction members occurs. During the transfer of the erected blanks to the transport device, the suction members are moved synchronously with the transport device.

[0003] US Patent US 4 625 575 to Le Bras concerns a cam assembly for a feeder mechanism in which the cam plate is formed for a continuous cam track and a shallower cam track. Cam track follower arms are used for relative movement within first and second cam tracks. Pick up means is connected to the cam arm by an eccentric arm and the cam tracks because the pick up means to move to an outwardly extended position and to an inwardly retracted position.

[0004] German patent DE 3 525 448 to I.M.A. concerns an apparatus for feeding and erecting collapsed cartons from a hopper mounted at an angle from the vertical. The apparatus comprises a rotatable frame to which vacuum cups are attached via a linkage. As the frame rotates, the suction cups retract so as to remove the collapsed cartons from the hopper and then to simultaneously transfer the collapsed cartons whilst separating the walls thereof. The retractable linkage is complex and, therefore, expensive to manufacture and maintain.

[0005] In WO 98/52825, there is shown a rotary feeder mechanism to supply blanks from an inclined hopper.

[0006] The prior art highlighted above refers to carton pick up means that rotates continuously, to cause the cartons to be withdrawn and accelerated to match the machine throughput speed. One problem associated with the transfer of cartons is that by combining the withdrawal and acceleration functions limits the machine speeds because a carton withdrawn by a rotary feeder is restricted by the rotary action.

[0007] The present invention and its preferred embodiment seeks to overcome or at least mitigate the problems associated with the prior art.

Summary of the Invention

[0008] In one aspect of the invention, there comprises, an apparatus for sequentially manipulating from a supply point of a hopper collapsed cartons having oppositely disposed face contacting panels and for transferring the

cartons to an in-feed end of a packaging machine, which apparatus comprising carton pick up means for sequentially engaging one of said face contacting panels and for withdrawing from the hopper a collapsed carton. The carton pick up means is connected to a shaft by a frame and moveable to move the blank in a transverse plane to the flow of cartons, the frame being slidably secured on a collar structure to move the frame in a linear action relative to a rotatable transfer mechanism, to transfer the carton on for further processing.

[0009] Optionally, the carton is transferred to acceleration means to be accelerated to match the velocity of the packaging machine.

[0010] In some embodiments, the linear movement of the carton pick up means immediately prior to and during withdrawal of a carton from the hopper is arrested for a brief interval by the action of a cam controlled cam bar which is movable radially during such brief interval and which is operably connected with the carton pick up means.

[0011] In other embodiments, the carton pick up means comprises a vacuum supply and a suction cup.

[0012] A controller may be provided to control the velocity of the transverse and linear motions and, as the case may be, the acceleration means.

[0013] A second aspect of the invention provides a method of sequentially manipulating from a supply point of a hopper collapsed cartons having oppositely disposed face contacting panels and for transferring the cartons to an in-feed end of a packaging machine, which method comprises the steps of withdrawing a carton in a transverse direction to the flow of cartons lowering the cartons to an accelerating means and accelerating the carton to match the speed of the transfer apparatus at the in-feed of the machine.

Brief Description of the Drawings

[0014] Exemplary embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

FIGURES 1 and 2 are perspective views of the carton blank feed mechanism of a packaging machine according to one aspect of the invention.

FIGURE 3 is a simplified drawing showing the feeder and blank transfer mechanism.

FIGURES 4 to 9 illustrate the process of feeding a blank from a hopper to the transfer mechanism.

Detailed Description of the Preferred Embodiment

[0015] Referring now to Figures 1, 2 and 3 of the drawings, there is shown a feeder mechanism 10 of a machine for processing carton blanks. The upstream end of the packaging machine includes a hopper H in which a mul-

tiplicity of cartons in flat collapsed condition are held ready for processing. As shown in Figure 3, the cartons are removed from the hopper H sequentially by a feeder mechanism 10 and transferred to a blank transfer mechanism 60 or conveyor for further processing.

[0016] The feeder mechanism 10 comprises a carton pick up means 12 for withdrawing the lower most collapsed carton from the hopper. In this embodiment the carton pick up means comprises a plurality of suction cups 14, 16, 18, 20, for example four suction cups, which are each supported on cup holders and a frame 19. The cup holder frame 19 is fixedly mounted respectively on elongate support rods 24. In one class of embodiments, the rods 24 are slidably mounted respectively on a collar structure 22 which is rotatably mounted to shafts 26, 28. The shafts 26, 28 are generally supported at their ends by a suitable bearing structure but which is conventional and which is mounted to a side frame. Suitable driving mechanism, for example a servomotor, is provided to rotate the shaft 26, in a transverse manner Y-Y' (figures 4, 5 and 7) described in more detail below.

[0017] In order to move the slide rods 24 in a reciprocal linear action through the collar structure 22, the slide rods are connected to support frame 40, shown in Figure 2 for transmitting the linear motion from the drive means.

[0018] The feeder is powered by suitable drive means, for example a servo motor S, driving a drive belt D to transmit drive to a pair of indexers 44, 50. The indexers 44, 50 convert a continuous drive input into a reciprocating, and optionally intermittent, drive output.

[0019] In order to impart a linear motion to the pick up means, linkages 43 and 42 that are pivotally connected together, connect the drive output to the support frame 40. Thus as linkage 43 rotates to and from in a reciprocal manner, the linkage 42 is caused to move in a linear motion in directions X-X' (Figures 1, 5, 6, 7 and 8), resulting in the linear motion of the frame 19 in the same direction.

[0020] Likewise, to impart a transverse motion to the pick up means, linkages 48 and 46 that are pivotally connected together, connect the drive output to the collar structure. Thus, as linkage 48 rotates to and from in a reciprocal manner, the linkage 46 is caused to move in a linear motion in directions Y-Y', resulting in the transverse swinging motion (about the shafts 26, 28) of the frame 19 in the same direction..

[0021] In this embodiment, it is envisaged that a vacuum break is provided in the feeder mechanism 10 which is used in conjunction with a vacuum supply to set the vacuum connection and cut off points thereby determining when the carton is held by the feeder mechanism 10.

[0022] Whilst the use of vacuum cups to supply cartons to the conveyor is preferred, it is envisaged that the present invention can be used or adapted to be used with other types of pick up means, for example grippers, without departing from the scope of the invention.

[0023] In order to accelerate the cartons, once withdrawn from the hopper H, acceleration wheels 34, 36 are

provided. In this embodiment, there comprises two pairs of acceleration wheels positioned adjacent each other to provide a nip in-feed point N to receive a leading edge of the carton and to allow the carton blank to pass there through. The acceleration wheels 34, 36 are mounted to drive shafts 32, 38 which are driven by suitable drive means, D1.

[0024] The acceleration wheels 34, 36 are mounted to the feeder frame 30, which can be fitted to a packaging machine or supplied as a separate module. It is envisaged that the feeder mechanism can be fitted to new machinery or fitted to existing machinery on a retro-fit basis.

[0025] The hopper H is, preferably, a "gravity feed" type whereby the carton blanks are held in the hopper at an incline to provide a positive feed so a continuous supply of cartons is maintained.

[0026] The transfer process will now be described with reference to Figures 4 to 9. In order for the blank to be transferred from the inclined position, the feeder mechanism 10 continuously and sequentially feeds cartons from the hopper to the in-feed transfer mechanism which is rotating constantly in direction V indicated by the arrow, shown in Figure 3.

[0027] The first step shown in Figure 4 is to move the pick up means 12 in a transverse direction Y towards the hopper H. The suction cup 20 is moved into contact with side wall of carton. A vacuum is then applied to the set of suction cups by the vacuum supply. Thus, the carton is withdrawn by moving the pick up means in a transverse direction Y'. As soon as the carton is moved in the transverse direction then the suction cup 20 is moved in a linear downward motion X to move the carton towards the acceleration wheels 34, 36, shown in Figure 5. Thereafter the carton is received in the nip in-feed of the wheels and is accelerated, shown in Figure 6. The vacuum is then maintained during this transfer stage so that the suction cups hold the side wall of the carton.

[0028] Once the carton is deposited at the wheels, the vacuum break disconnects the vacuum supply from the suction cups to release the carton, by moving the suction cup in a transverse and linear movements X', Y', shown in Figure 7.

[0029] The acceleration wheels 34, 36 accelerate the blank which is then placed in contact with a leading lug of the conveyor set shown generally at Figure 8. The lugs maintain the position of the carton and move the carton downstream to a set up station. At the same time, the suction cup 20 is returned to the start position shown in Figure 9.

[0030] It will be seen from Figures 4 to 9 that as the feeder withdraws and manipulates the cartons, they also undergo a translation about the path of the rotary movement of the transfer mechanism.

[0031] The feeder mechanism 10, the transfer mechanism are controlled by a controller to coordinate the throughput speeds of the cartons.

[0032] It is envisaged that the adjustments to the ma-

chine are controlled by computer program which enables adjustment to be automated thereby minimizing machine downtime. For example, speed of the feeder can be increased or decreased if it is required or the acceleration vectors can be increased or decreased to change the angle of movement.

[0033] It has been found that by separating the withdrawal function and the acceleration of the carton into two discrete functions, that the throughput speeds can be increased as the risk of carton damage is reduced.

[0034] A machine according to the present invention is adjustable in a number of respects so as to be able to process cartons containing numerous configurations of groups of articles to create a range of carton size and shape, for example, four bottles to eight bottles without undue amounts of downtime being spent in adjusting the machines. Indeed, the machine can be readily adapted to process cartons to produce a wide range of cartons having numerous article group configurations.

Claims

1. An apparatus for sequentially manipulating from a supply point of a hopper (4) collapsed cartons having oppositely disposed face contacting panels and for transferring the cartons to an in-feed end of a packaging machine, the apparatus comprising carton pick up means (12) for sequentially engaging one of said face contacting panels and for withdrawing from the hopper (H) a collapsed carton, **characterized in that** the carton pick up means (12) is connected to a shaft by a frame (19) and moveable to move the blank in a transverse plane to the flow of cartons, the frame (19) being slidably mounted on a collar structure (22) to move the frame (19) in a linear action relative to a rotatable transfer mechanism, to transfer the blank for further processing.
2. An apparatus as claimed in claim 1 wherein the carton is transferred to acceleration means (34, 36) to be accelerated to match the velocity of the packaging machine.
3. An apparatus according to claim 1 or claim 2 wherein the linear movement of said carton pick up means (12) immediately prior to and during withdrawal of a carton from the hopper (H) is arrested for a brief interval by the action of a cam controlled cam bar which is movable radially during such brief interval and which is operably connected with said carton pick up means (12).
4. An apparatus according to any of claims 1 to 3 wherein said carton pick up means (12) comprises a vacuum supply and a suction cup (14, 16, 18, 20).
5. An apparatus machine according to any preceding

claim wherein said face contacting panels comprise opposite side walls of the carton.

6. An apparatus according to any preceding claim wherein the apparatus is driven by a servo motor (5).
7. An apparatus according to any preceding claim wherein a controller controls the velocity of the transverse and linear motions and, as the case may be, the acceleration means (34, 36).
8. A method of sequentially manipulating from a supply point of a hopper (H) collapsed cartons having oppositely disposed face contacting panels and for transferring to the cartons to an in-feed end of a packaging machine, which method comprises the steps of withdrawing a carton in a transverse direction to the flow of cartons lowering the cartons to an accelerating means (34, 36) and accelerating the carton to match the speed of the transfer apparatus at the in-feed of the machine.

Patentansprüche

1. Vorrichtung zum sequenziellen Bearbeiten zusammengelegter Schachteln mit gegenüberliegend angeordneten flächenberührenden Wandflächen von einem Zuführpunkt eines Magazins (H) und zum Transferieren der Schachteln zu einem Einspeisungsende einer Verpackungsmaschine, wobei die Vorrichtung Schachtelaufnahmemittel (12) umfasst, um sequenziell eine der flächenberührenden Wandflächen in Eingriff zu nehmen und eine zusammengelegte Schachtel aus dem Magazin (H) zu entnehmen, **dadurch gekennzeichnet, dass** die Schachtelaufnahmemittel (12) über einen Rahmen (19) mit einer Welle verbunden sind und bewegt werden können, um den Zuschnitt in einer Ebene zu bewegen, die quer zu dem Strom von Schachteln verläuft, wobei der Rahmen (19) gleitend auf einer Manschettenstruktur (22) angebracht ist, um den Rahmen (19) in einer linearen Bewegung relativ zu einem rotierbaren Transfermechanismus zu bewegen, um den Zuschnitt für eine weitere Verarbeitung zu transferieren.
2. Vorrichtung nach Anspruch 1, wobei die Schachtel zu Beschleunigungsmitteln (34, 36) transferiert wird, um beschleunigt zu werden, um der Geschwindigkeit der Verpackungsmaschine zu entsprechen.
3. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei die lineare Bewegung der Schachtelaufnahmemittel (12) unmittelbar vor und während der Entnahme einer Schachtel aus dem Magazin (H) für ein kurzes Intervall durch die Wirkung einernockengesteuerten Nockenschiene gestoppt wird, die wäh-

rend eines solchen kurzen Intervalls radial bewegt werden kann und wirksam mit den Schachtelaufnahmemitteln (12) verbunden ist.

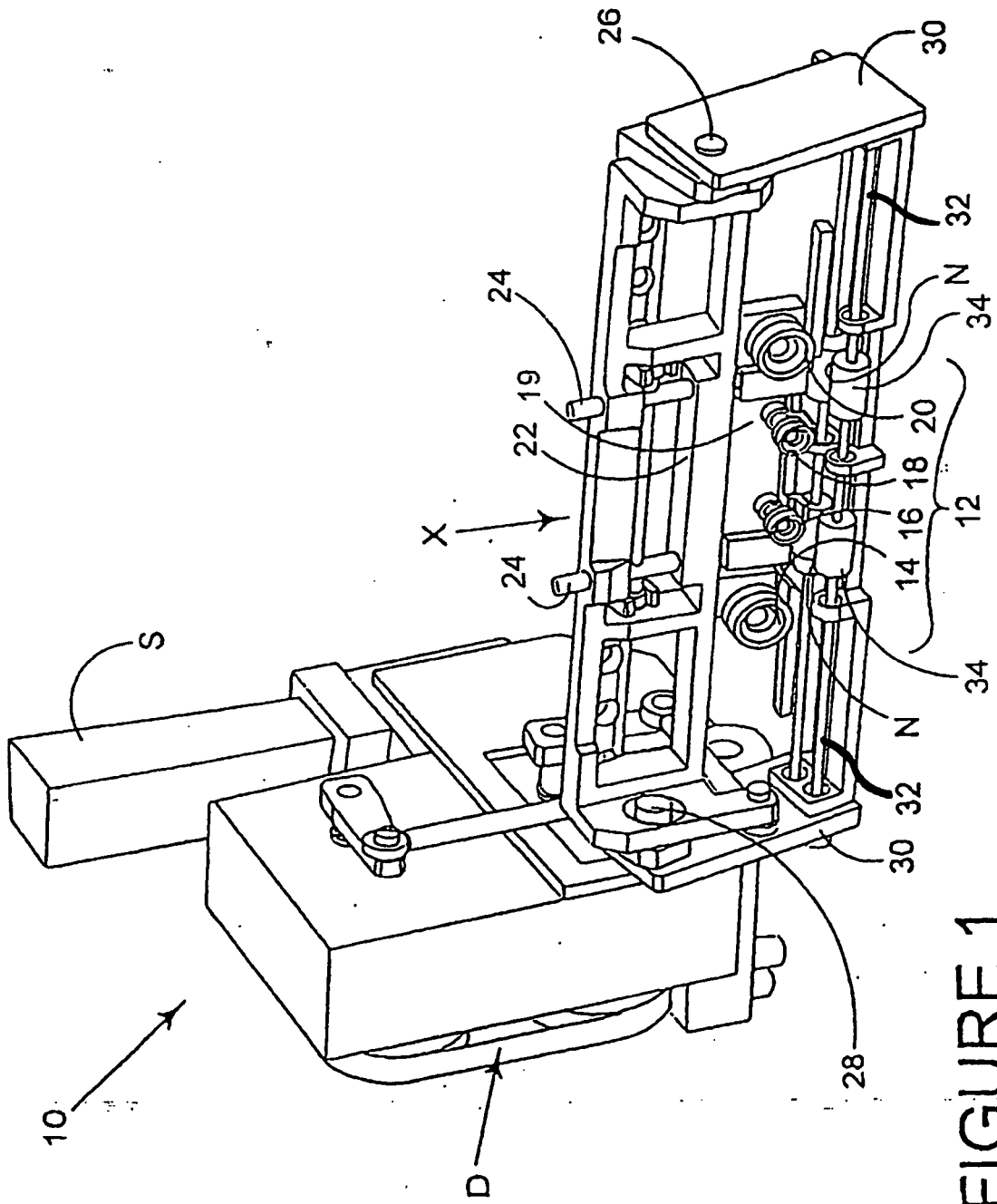
4. Vorrichtung nach einem der Ansprüche 1 bis 3, wobei die Schachtelaufnahmemittel (12) eine Vakuumszufuhr und einen Saugnapf (14, 16, 18, 20) umfassen.
5. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die flächenberührenden Wandflächen gegenüberliegende Seitenwände der Schachtel umfassen.
6. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Vorrichtung von einem Stellmotor (S) angetrieben wird.
7. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei eine Steuereinheit die Geschwindigkeit der quer und linear verlaufenden Bewegungen steuert sowie gegebenenfalls die Beschleunigungsmittel (34, 36).
8. Verfahren zum sequenziellen Bearbeiten von zusammengelegten Schachteln von einem Zuführungspunkt eines Magazins (H), die gegenüberliegend angeordnete flächenberührende Wandflächen aufweisen, und zum Transferieren der Schachteln zu einem Einspeisungsende einer Verpackungsmaschine, wobei das Verfahren die Schritte des Entnehmens einer Schachtel in einer quer zu dem Strom von Schachteln verlaufenden Richtung, des Absenkens der Schachteln auf Beschleunigungsmittel (34, 36) und des Beschleunigens der Schachtel umfasst, um der Geschwindigkeit der Transfervorrichtung an dem Einspeisungsende der Maschine zu entsprechen.

Revendications

1. Un appareil pour manipuler de façon séquentielle, depuis un point d'alimentation d'une trémie (H), des boîtes en carton aplaties ayant des panneaux de contact de face situés de façon opposée et pour transférer les boîtes en carton jusqu'à une extrémité d'alimentation d'une machine d'emballage, l'appareil comprenant un moyen pour attraper les boîtes en carton (12) pour engager de façon séquentielle l'un de ces panneaux de contact de face et pour retirer de la trémie (H) une boîte en carton aplatie, **caractérisé par le fait que** le moyen pour attraper les boîtes en carton (12) est relié à un arbre par un bâti (19) et est déplaçable pour déplacer la découpe sur un plan transversal au courant des boîtes en carton, le bâti (19) étant assemblé de façon glissante sur une structure de préhension (22) pour déplacer le

bâti (19) en une action linéaire par rapport à un mécanisme de transfert tournant, pour transférer la découpe pour continuer d'être traitée.

2. Un appareil tel que revendiqué dans la revendication 1 dans lequel la boîte en carton est transférée jusqu'à un moyen d'accélération (34, 36) pour être accélérée afin d'égaliser la vitesse de la machine d'emballage.
3. Un appareil selon la revendication 1 ou la revendication 2 dans lequel le mouvement linéaire dudit moyen pour attraper les boîtes en carton (12), immédiatement avant et pendant le retrait d'une boîte en carton de la trémie (H), est arrêté pendant un bref intervalle par l'action d'une barre à came commandée par came qui peut se déplacer de façon radiale pendant ce bref intervalle et qui est reliée de façon opérationnelle avec ledit moyen pour attraper les boîtes en carton (12).
4. Un appareil selon l'une quelconque des revendications 1 à 3 dans lequel ledit moyen pour attraper les boîtes en carton (12) comprend une alimentation de vide et une ventouse (14, 16, 18, 20).
5. Une machine appareil selon l'une quelconque des revendications précédentes dans laquelle lesdits panneaux de contact de face comprennent des parois latérales opposées de la boîte en carton.
6. Un appareil selon l'une quelconque des revendications précédentes dans lequel l'appareil est propulsé par un servomoteur (S).
7. Un appareil selon l'une quelconque des revendications précédentes dans lequel un contrôleur contrôle la vitesse des mouvements transversaux et linéaires et, le cas échéant, le moyen d'accélération (34, 36).
8. Une méthode pour manipuler de façon séquentielle, depuis un point d'alimentation d'une trémie (H), des boîtes en carton aplaties ayant des panneaux de contact de face situés de façon opposée et pour transférer les boîtes en carton jusqu'à une extrémité d'alimentation d'une machine d'emballage, cette méthode comprenant les étapes de retirer une boîte en carton en une direction transversale au courant des boîtes en carton en baissant les boîtes en carton jusqu'à un moyen d'accélération (34, 36) et accélérer la boîte en carton pour égaliser la vitesse de l'appareil de transfert dans l'extrémité d'alimentation de la machine.



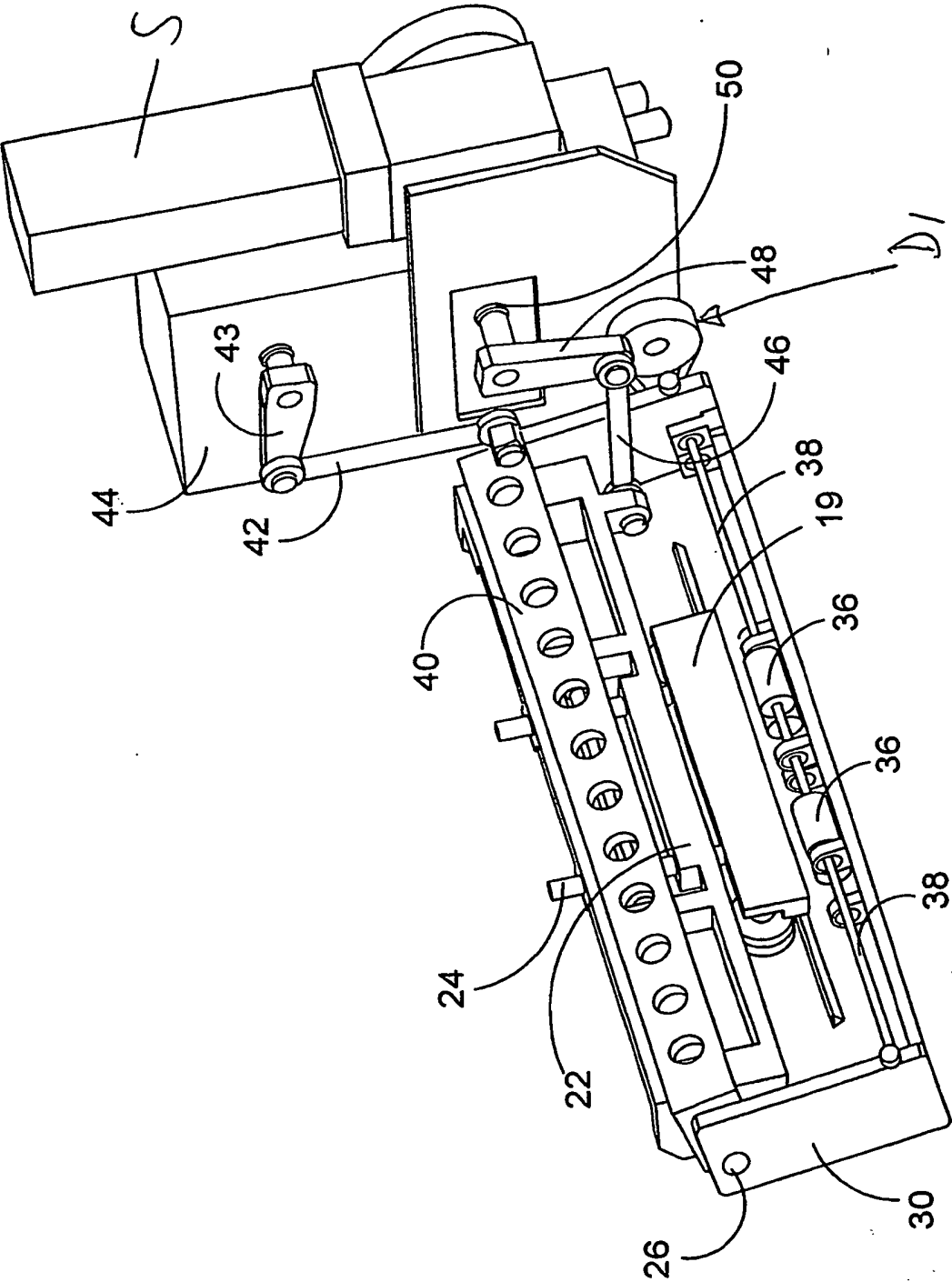


FIGURE 2

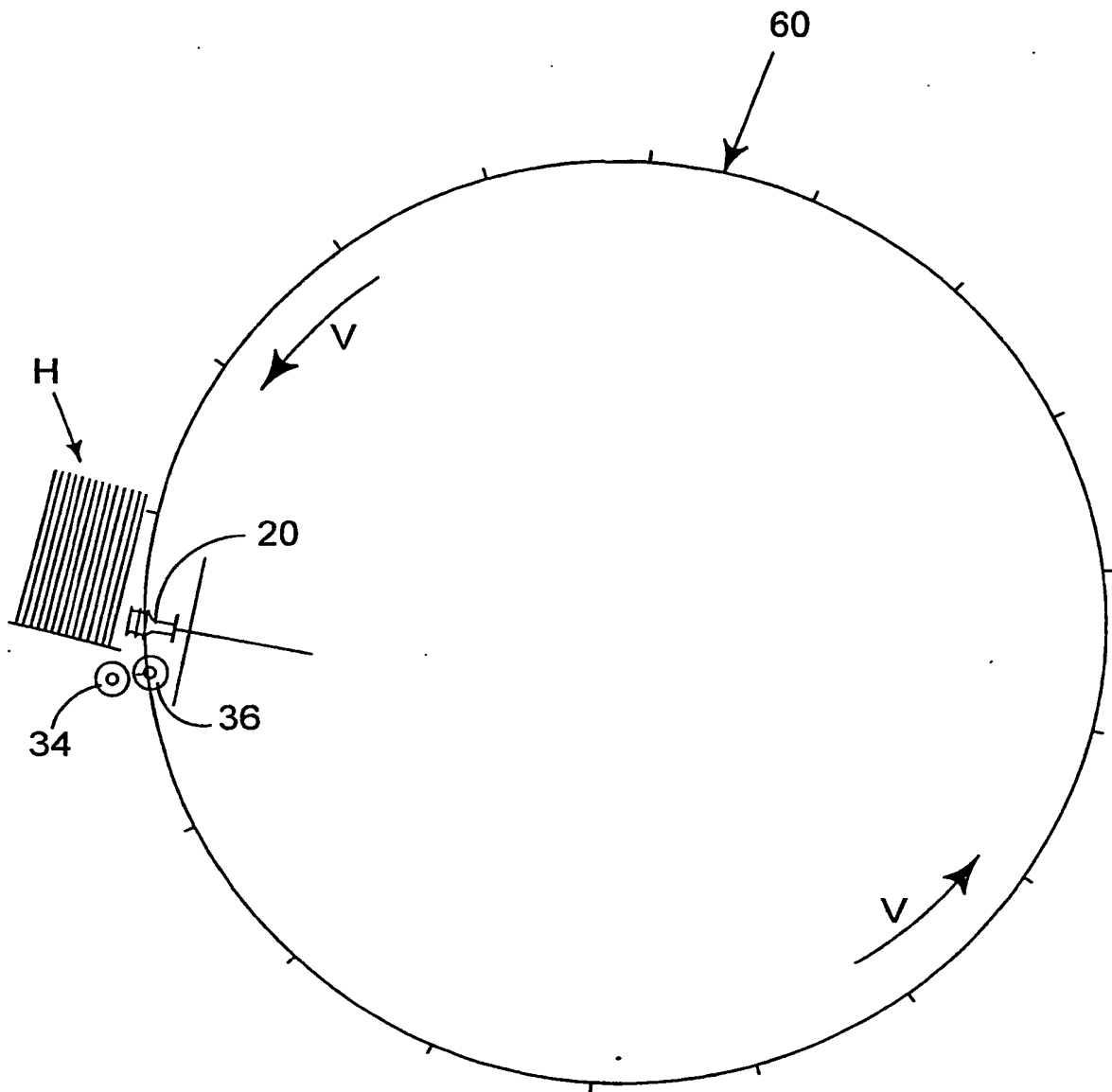


FIGURE 3

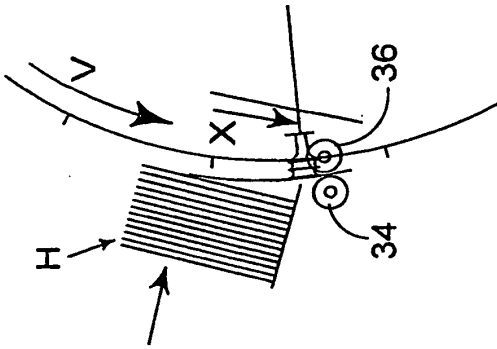


FIGURE 4

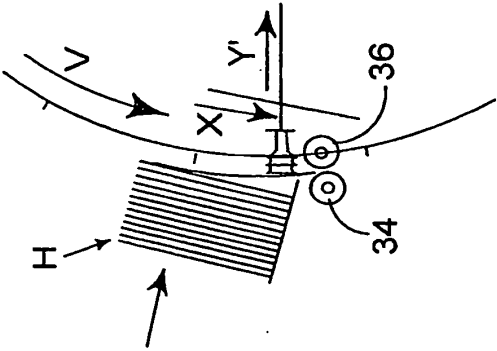


FIGURE 5

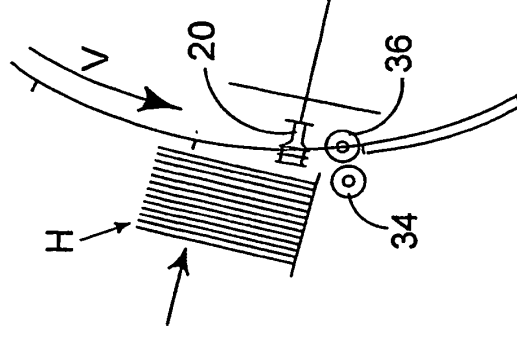


FIGURE 6

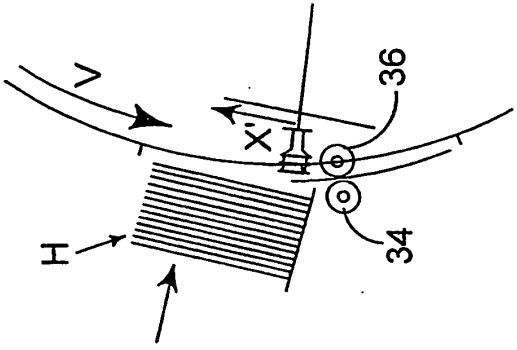


FIGURE 7

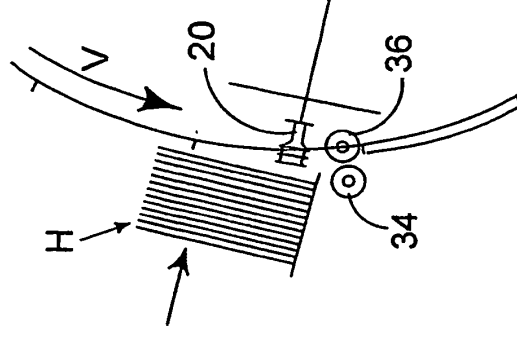


FIGURE 8

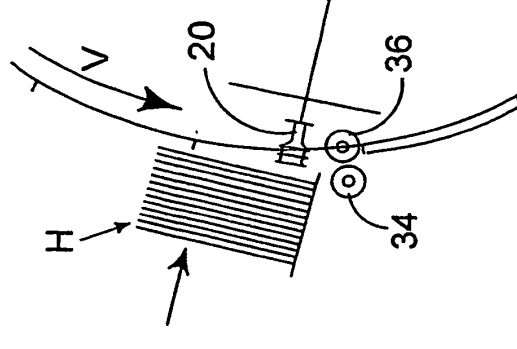


FIGURE 9

REFERENCES CITED IN THE DESCRIPTION

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