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(54) Production of profiled self-portable tiles.

(57) The invention provides a process and a machine by which self-portable tiles for the roofs of warehouses, industrial buildings and other structures can be produced on the building site. A machine mounted on the chassis of a truck includes a train of rolls (5) for profiling metal strip, regulation and maintenance systems corresponding to each pair of rolls, an operating system made up of a single chain (16), and means for balancing the profiling machine through central hinges (24) and hydraulic pistons (25), all synchronised to allow the profiling and curving of the self-portable tiles produced. Another feature is a venation device that, conjugated to the profiling machine and located between the last group of profiling rolls and the first group of bending rolls, and working synchronously with these groups, preferably using the system of movement transmission of the profiling machine, makes a transverse cold venation in the lateral longitudinal sections of the adjusted tile, offering a higher mechanical resistance to the efforts and demands originated by the wind and by the weight of the self-portable.

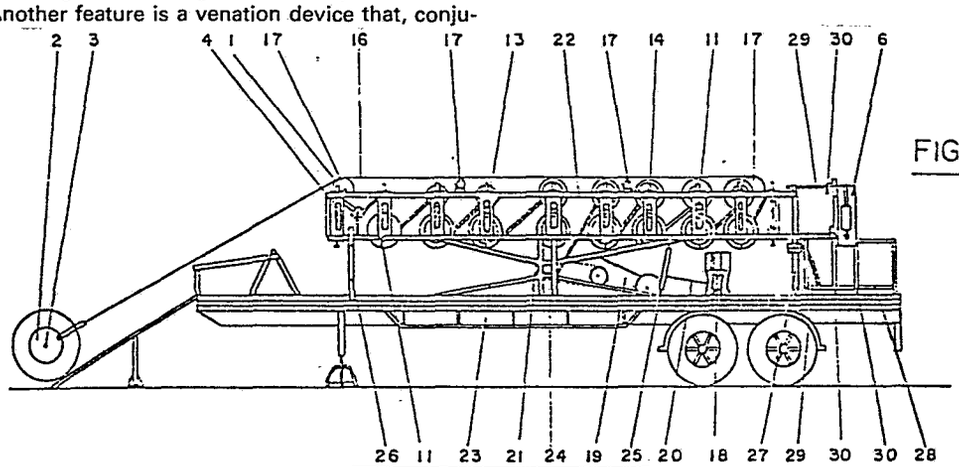

FIG.1

EP 0 163 310 A2

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Production of profiled self-portable tiles

This invention relates to the production of profiled and curved metallic roof tiles and roofs, e.g. for warehouses, industrial buildings and other structures, and provides a process and a device for producing such metallic coverings or roofs right on the building site.

Nowadays, self-supporting tiles for covering wide free spaces are known; however, those tiles are joined by welding.

The device which is the subject of this invention will produce tiles that are profiled and curved in single pieces in the exact and same length as the free empty space of the structure to be covered. Such tiles have their strength calculated to avoid the building of support structures, therefore being self-supporting.

The production of these tiles in large length pieces, up to 50 metres long, required the device to be taken onto the building site, and thus the development of a machine allowing a complex and difficult profiling procedure to be carried out in a quite light and compact machine, which could be mounted on the chassis of a truck and taken to the building site.

According to one embodiment of the invention, a machine for producing profiled self-portable tiles comprises means for continuously profiling metal strip to form a tile transportably mounted and pivotable so as to deliver the profiled strip upwards from the horizontal.

In another aspect, the invention provides a process of producing elongated, profiled, self-portable tiles which comprises passing a strip of metal through a transportably mounted train of profiling rolls and hence to the position where the tile is to be installed.

The invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which

Fig. 1 represents a lateral view of a machine according to the invention;

Fig. 2 represents a lateral view of the machine, balanced to produce the self-portable tile;

Fig. 3 represents a lateral view of the machine posterior in relation to Fig. 1, where is shown in particular its driving system for the profiling rolls;

Fig. 4 represents an exploded view, showing a pair of profiling rolls and their adjustment devices;

Fig. 5 represents a masonry structure on which are placed the self-portable tiles produced by the machine here described;

Fig. 6 represents a lateral view of the machine to profile self-portable tiles, provided with the venation device described hereinafter;

Fig. 7 represents a lateral view of a venation device which forms a further feature of the invention, showing, diagramatically, its position between the last group of profiling rolls (A) and the first group of bending rolls (B), and also showing its system of movement transmission, having a gear wheel (39) connected to the machine transmission chain system (40);

Fig. 8 represents a front view of the device, showing a self-portable tile being venated going through both the upper (51) and lower (52) groups ofvenation rolls.

Referring first to Fig. 1, the tile is produced either from galvanised or pre-painted strip supplied in the form of coils, which are drawn on to the truck-machine by means of a windlass with ratchet (1). The coil is mounted horizontally between plates (2) over an axle (3).

The profiling begins when the end of the coil is introduced through two plain parallel axles (4) like a calender. Afterwards, it is immediately received by a pair of superposed rolls (5) of different diameters covered with a layer of rubber. The function of these rolls is to draw the strip. The following pairs of rolls, also superposed, successively shape the strip until the desired profile of the tile is reached.

In order to range unused residues of material that occur between one roll and the other due to the abrupt deformation of the strip, causing irregularities in the tile such as wrinkles or slight ruptures, small auxiliary rolls of small diameter are used. These small rolls may be located at any point of the strip, and over or under it, within the body of the machine. To use them, one just has to verify where in the tile the deformation is taking place.

At the opposite end to the coil there is the guillotine (6) that cuts and borders the tile.

The novelties that will guide the present specifications include the adjusting and supporting system, corresponding to each pair of rolls, the method of operating them and the balancing of the machine.

The rolls are made of circular sections (7), of different diameters and are mounted on an axle (8). The sections are held together by screws with beam (9) one at each side, screwed over the axle. This system allows lateral displacements of the assembly enabling their alignment and their centering in relation to the guillotine.

At the ends of the axle are mounted roller bearings that are set in a square bases, the bearings (10). These bearings, in turn, are set in a female type mortise fitted in the frame of the device. This mortise, the link (11), is positioned vertically in such a way that the rolls are fitted in the upper part, sliding over its bed until they reach the end of a screw (12) that serves as a stop.

Due to the different thicknesses of strip used, and therefore the different degrees of mechanical resistance, it is necessary to change the spacing, that is, the space between rolls. Therefore, between the bearings of the lower roll and those of the upper roll there is another screw (13).

In order that different positions can be set for further use, this screw has the characteristics of an internal micrometer.

When dealing with curved tiles, the pairs of rolls are moved vertically. The movement of each pair of rolls, and which pairs of rolls are to be moved, is always in accordance with the degree of curvature desired. So that we may set these movements, the upper part of the link is closed by a cap through which passes a last screw (14). This screw also has the characteristics of a micrometer, though to measure in depth.

Mounted on one of the ends of the axle of each roll there is a gear wheel (15), and all of these are interaligned in such a way that an endless chain (16) sets all the rolls in motion simultaneously in the same direction. The circuit is closed with the use of free rotation gear wheels (17) mounted in line with, but above, the line of rolls over which the chain returns to the first pair of profiling rolls.

Inserted into the circuit, as the last free rotation gear wheel of the chain's return, is the coil propagation system (1).

The motive power is generated by a stationary motor (18) connected to the machine. To transfer the motive power to the rolls a reduction gearbox of cylindrical gear wheels with exchange (19) is used. This gearbox receives the power through "V" belts (20) and transmits it to the rolls through a double gear wheel (21), mounted at its exit, which is integrated in the roll operating circuit. However, for greater accuracy of operation a hydraulic engine is usually integrated into the existing hydraulic circuit, excluding the reducer, with additional advantages as it is lighter and more compact, and besides it may be connected at any point of the operating circuit.

Tests, made by the applicant for this patent, show that it is possible to cover free empty spaces up to 30 metres, since a curvature of approximately 3.50 metres of deflection can be obtained in the finished tile. As the device not only profiles the tiles horizontally but also has a low height, long before the tile reaches the desired length it already touches the ground.

In order to make it possible to obtain the above-mentioned tile, a balancing system has been produced in which the device is divided into two distinct parts, namely the chassis (22) (the upper part that supports the rolls), and the base (23). The linkage between these parts is located approximately in the middle of the length of the device and comprises a pair of hinges (24). Thus using hydraulic pistons (25) as a second point of support, the chassis may be moved by an angular movement in such a way that the end from where the tile emerges remains pointing upwards. For greater operating safety two extra support arms are used, one fixed (26) and the other telescopic (27).

Both the guillotine and the control platform (28) are connected to the chassis by extendible arms (29) and hinges (30), allowing their adjustment according to the angle of inclination of the chassis, in order to level the platform and to give the guillotine a perpendicular position in relation to the tile.

As shown in Fig. 5, the tile is mounted using trestles (31) fixed on supporting profiles (32) made of angle iron, which lean on the upper beam (33) of the wall.

Tie-rods (35) are used in order to avoid the need for over-sized metallic or masonry structures to counter the thrust of the tile (34) that causes horizontal movement of the walls.

Another novel feature of this invention comprises a mechanical venation (corrugating) device that, connected to the profiling and bending machine and placed between the last group of profiling rolls and the first group of bending rolls, working synchronously with both groups, preferably using their motion transmission system, performs a cold venation transverselyto the lateral and longitudinal sections of the adjusted tile, offering it, according to tests made by the applicant, a greater mechanical resistance to the efforts and demands arising from the effects of wind and of the weight of the self-portable covering, installed. It also assists the curving of the self-portable tile to small radii and higher deflections in circular structures with metallic strips.

The device for venation of self-portable tiles, here described, is located between the last group of profiling rolls (A) and the first group of bending rolls (B) and is essentially composed of a structure or supporting frame (36) whose columns (37) integrate an upper horizontal axle (38) on which is located a gear wheel (39) conjugated to the machine transmission chain

system (40) and also, in a parallel and posterior plane relative to the gear wheel (39), a gear wheel, part of a pair of intermediate gear wheels (41), interconnected by chain (42), on whose lower horizontal axle (43) of that pair, in a parallel plane and posterior to it there is a main gear wheel or "planet" (44) conjugated, in the same plane, to a moving gear wheel or upper "satellite" (45) located on a horizontal axle (46) and to a moving gear wheel or lower "satellite" (47) located on a horizontal axle (48) that is conjugated to a moving gear wheel (49) located on a horizontal axle (50) parallel to the axle (48), and within the frame (36) on the axles of the gear wheels there is an upper group of small venation rolls (51a, 51b and 51c) and a lower group of small venation rolls (52a, 52b and 52c) all of them with ribs in their surfaces, properly structured (53) and with transmission system by conical gear wheels (54) and also having both upper (55) and lower (56) devices for depth adjustment, to determine the degree of the curvature of the tile.

The machine and process of the invention can provide a self-portable tile profiled in several lengths and widths, with its own profile, longitudinally curved, and with transverse venation along its edges. They also allow the production of self-portable tiles with a smaller bending radius or curvature than the conventional ones, as from a minimum of six metres, and also allow the use of metallic plates of a minor thickness in the smaller free empty spaces to be covered. They also allow the use of venation both in the plane and curved self-portable tiles, as pre-determined by the utility machine.

This invention is concerned, inter alia, with a machine to profile self-portable tiles for warehouses, industries and other structures, assembled in a truck chassis, whose purpose is to produce the mentioned metallic coverings or roofs right on the building site. This machine offers construction and functioning technical characteristics totally different from those presented by similar devices existing in the consumer market in general, as can be seen not only from the detailed description herein but also from the accompanying drawings.

CLAIMS:

1. A machine for producing profiled, self-portable tiles which comprises means for continuously profiling metal strip to form the tile, said means being transportably mounted and pivotable to deliver the profiled strip upwardly from the horizontal.

2. A machine according to claim 1 wherein the profiling means is mounted on a chassis (22) pivotably mounted on a free motion axle (26) and supported by a hydraulic cylinder adapted to lift and lower the chassis to and from the desired delivery angle.

3. A machine according to claim 1 or claim 2 in which the profiling means is a train of profiling rolls, having a motive power transmission system which includes an endless chain (16) of steel links that, in a single piece starting from an intermediate axle (36), moves simultaneously all the profiling rolls (5), going from the lower roll to its upper partner and from there, one upon another, to the following group of rolls, and when it reaches the last pair of rolls it is carried by tension regulator wheels (17) back to the opposite end of the machine, moving again both groups of rolls which started the profiling (5) and also returning to the intermediate axle (36), closing the cycle of the chain translation, in which there is a double gear wheel (21) interconnected to an exchange (19), and this one through belts (20) to a stationary engine (18).

4. A machine according to any preceding claim having a chain starting from the intermediate axle (36), more particularly from its double gear wheel (21), to operate the cutting guillotine (6) of the assembled tile at the exit of the profiling machine.

5. A machine according to any preceding claim having a vertical regulation of the pairs of rolls through a screw (14) that passes through a cap fixed to the upper part of a female type mortise, the link (11), whose characteristics are those of a depth micrometer, while between those pairs, also in the vertical, the adjustment is made through a screw (13) located between the bearings (10) of both the upper and the lower rolls.

6. A machine according to any preceding claim in which the adjustment of the pairs of rolls in their transverse sense is made through a screw with a beam (9) screwed over an axle (8) that keeps the circular sections of different diameters (7) that form the rolls (5) closed together and allows their alignment and centering in relation to the guillotine (6).

7. A machine according to any preceding claim in which the upper part of the machine, the so-called chassis (22), is subjected to an angular movement through a pair of hinges (24) that join the chassis, in the middle of the length of the device, to the base (23), the movement, the so-called balancing, being carried out through two hydraulic pistons (25), and the chassis being supported, after completion of the movement, by two arms, one fixed (26) and the other telescopic (27).

8. A machine according to any preceding claim having a venation device located between the last group of profiling rolls (A) and the first group of bending rolls (B) made up, basically, of a structure or supporting frame (36) in whose columns (37) there is an upper horizontal axle (38) where there is a gear wheel (39) conjugated to the machine transmission chain system (40) and also in a

parallel plane and posterior relatively to the gear wheel (39), one gear wheel part of a pair of intermediate gear wheels (41) interconnected by a chain (42) in whose lower horizontal axle (43) of that pair, in a parallel plane and posterior to it, there is a main gear wheel or "planet" (44) conjugated, in the same plane, to a moving gear wheel or upper "satellite" (45) located in a horizontal axle (46) and to a moving gear wheel or lower "satellite" (47) located in a horizontal axle (48) that is conjugated to a moving gear wheel (49) located in a horizontal axle (50) parallel to the axle (48),and within the frame (36) in the axles of the gear wheels there is an upper group of small venation rolls (51a, 51b and 51c) and a lower group of small venation rolls (52a, 52b and 52c), all of them with ribs in their surfaces, properly structured and with transmission systems by conical gear wheels and , also, having both upper (55) and lower (56) depth regulation devices.

9. A machine according to claim 8, having two pairs of groups of venation rolls, upper group (51) and lower group (52), each pair baing located in one of the two columns of the support frame (36), assuring a symmetrical venation of the self-portable tile.

10. A machine according to claim 8 or claim 9 in which the upper and lower depth regulation devices (55 and 56, respectively) of the upper group of venation rolls (51) and of the lower group of venation rolls (52) serve to predetermine the degree of curvature of the self-portable tile.

11. A process of producing elongated, profiled, self-portable tiles which comprises passing a strip of metal through a transportably mounted train of profiling rolls and thence to the position where the tile is to be installed.

12. A process according to claim 11 in which the strip is both profiled and transversely venated (corrugated).

13. A process according to claim 12 in which the strip is passed successively through profiling, venating and bending rolls.

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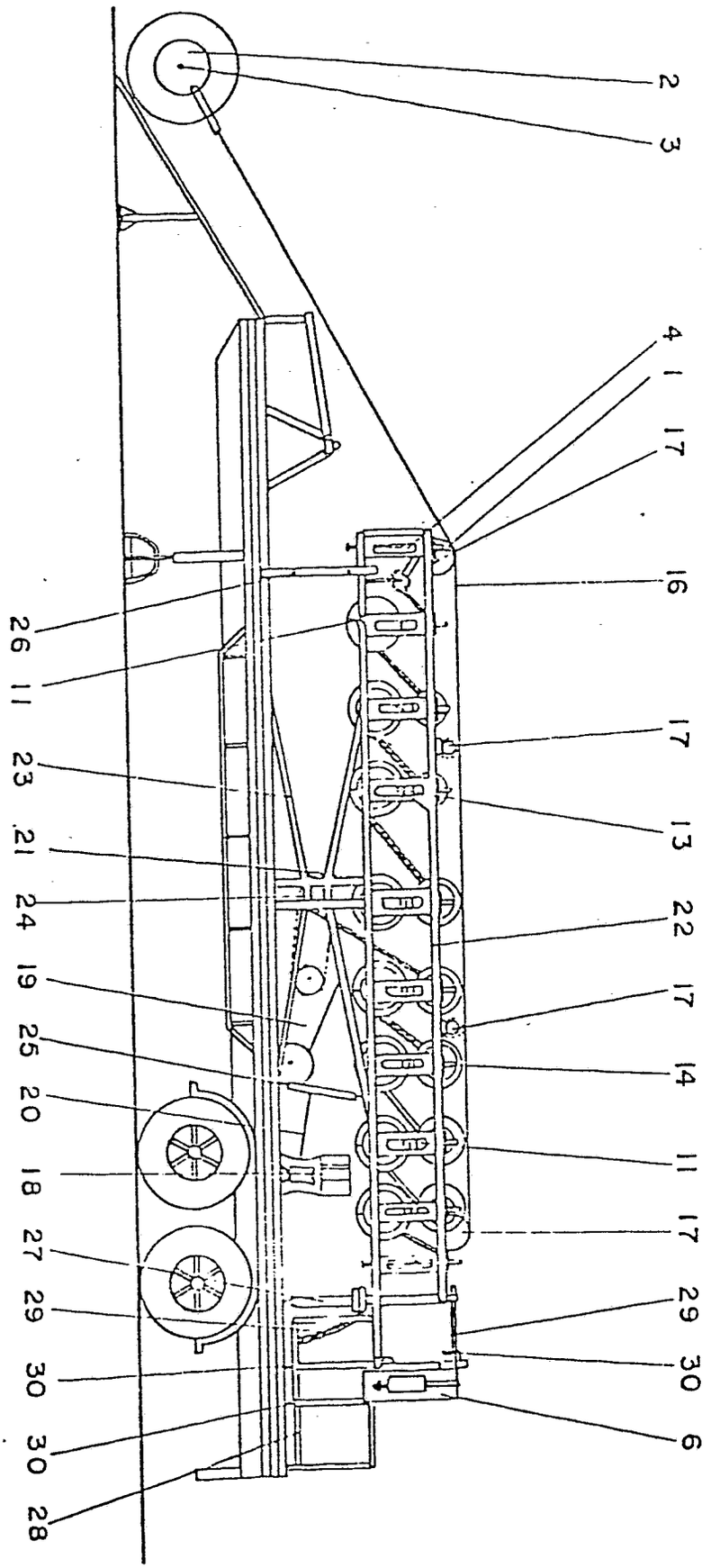

FIG.1

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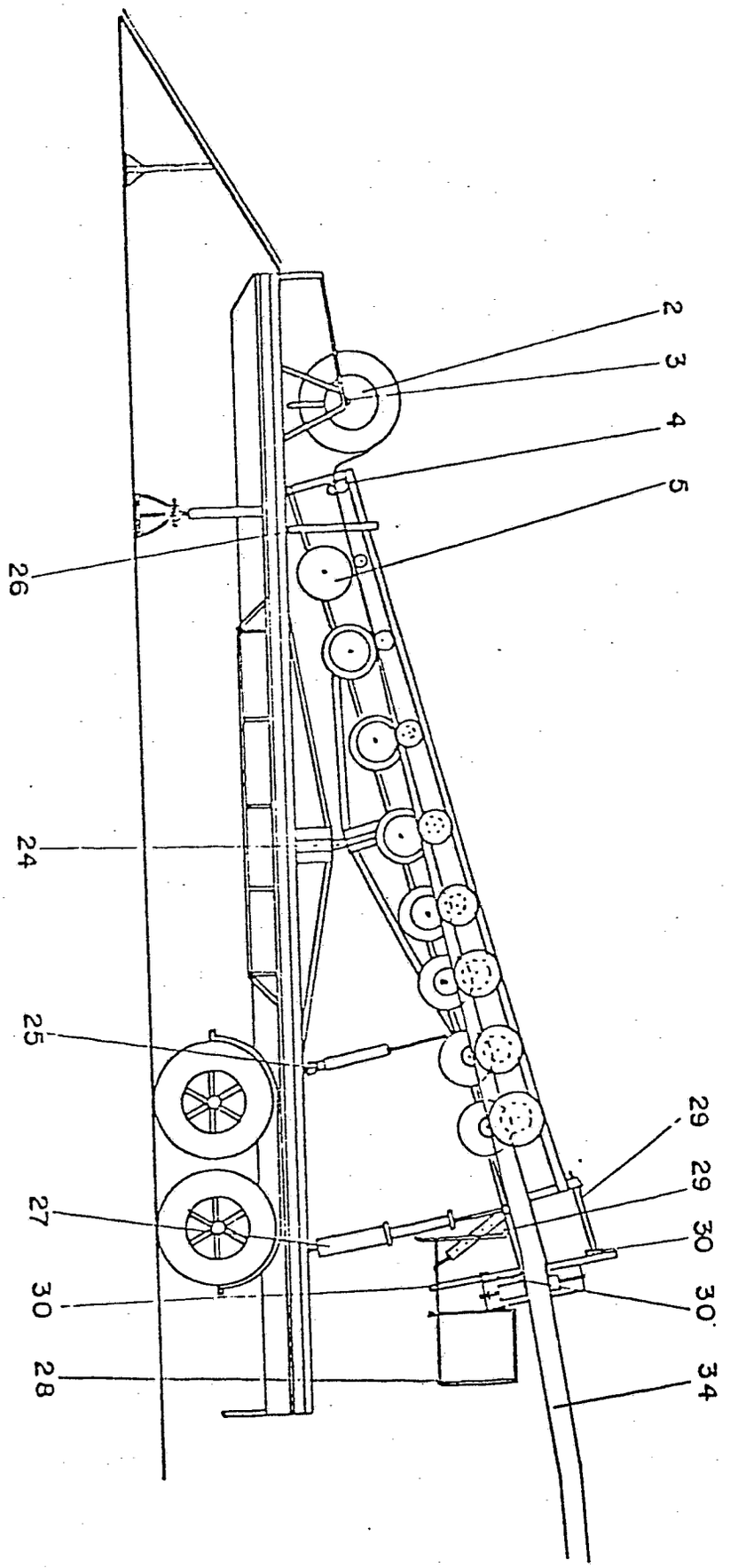

FIG. 2

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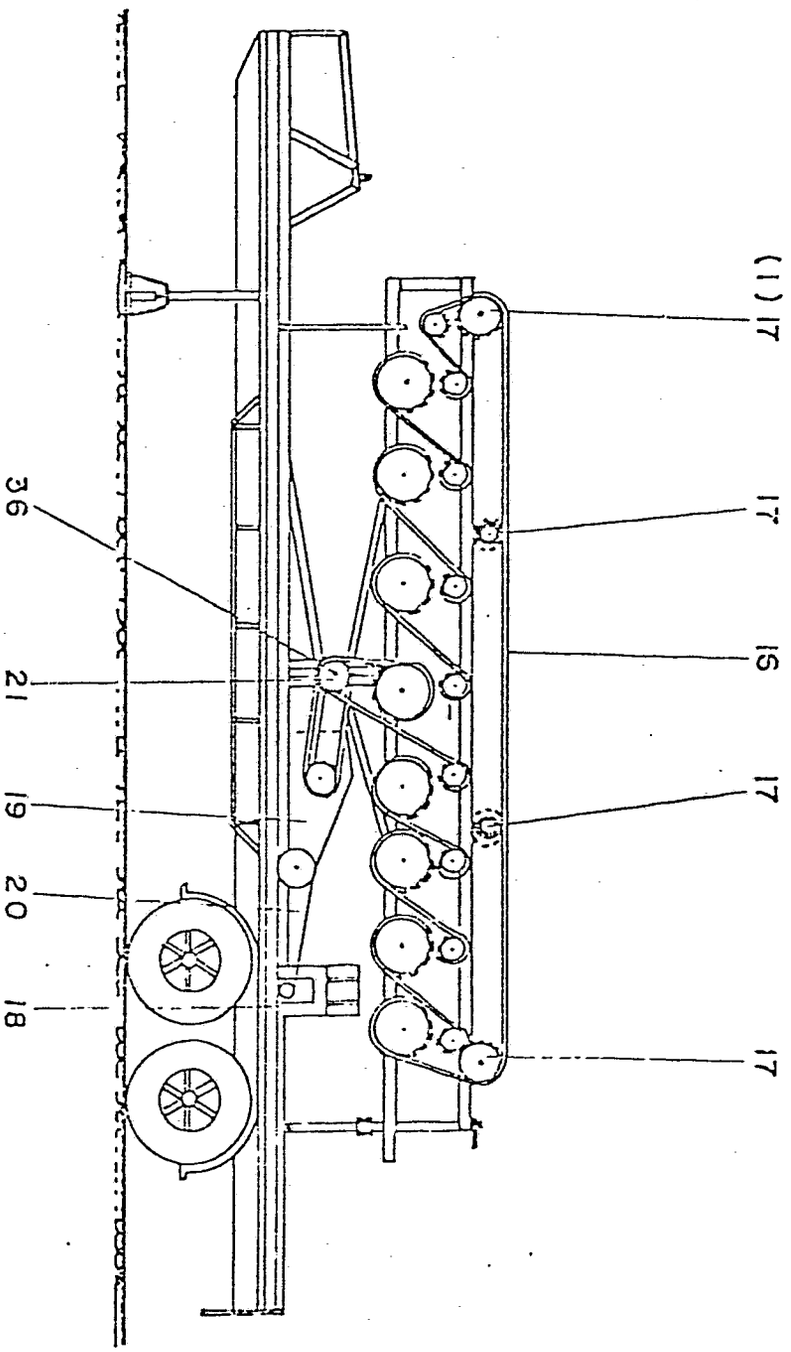

FIG.3

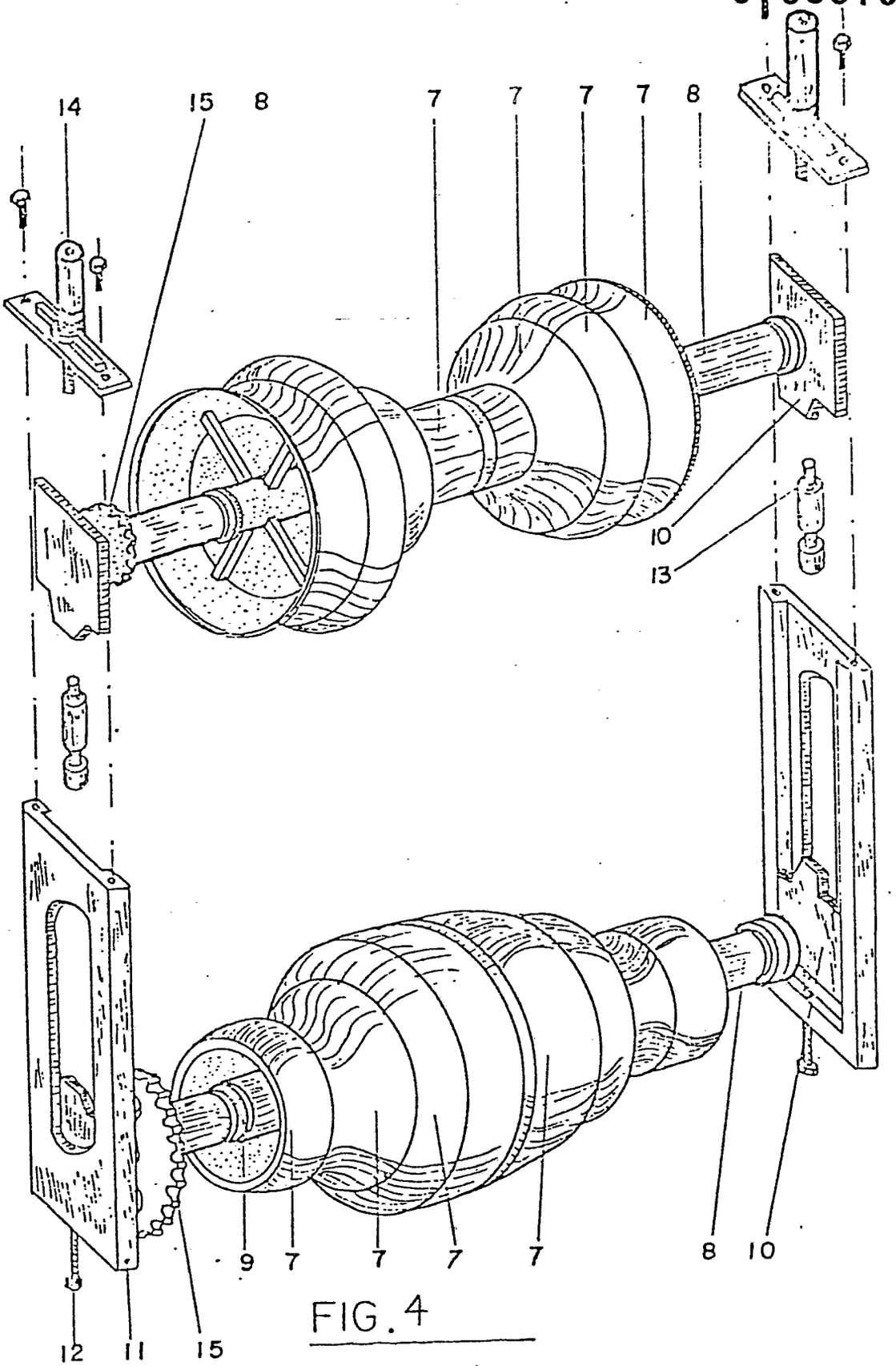

FIG. 4

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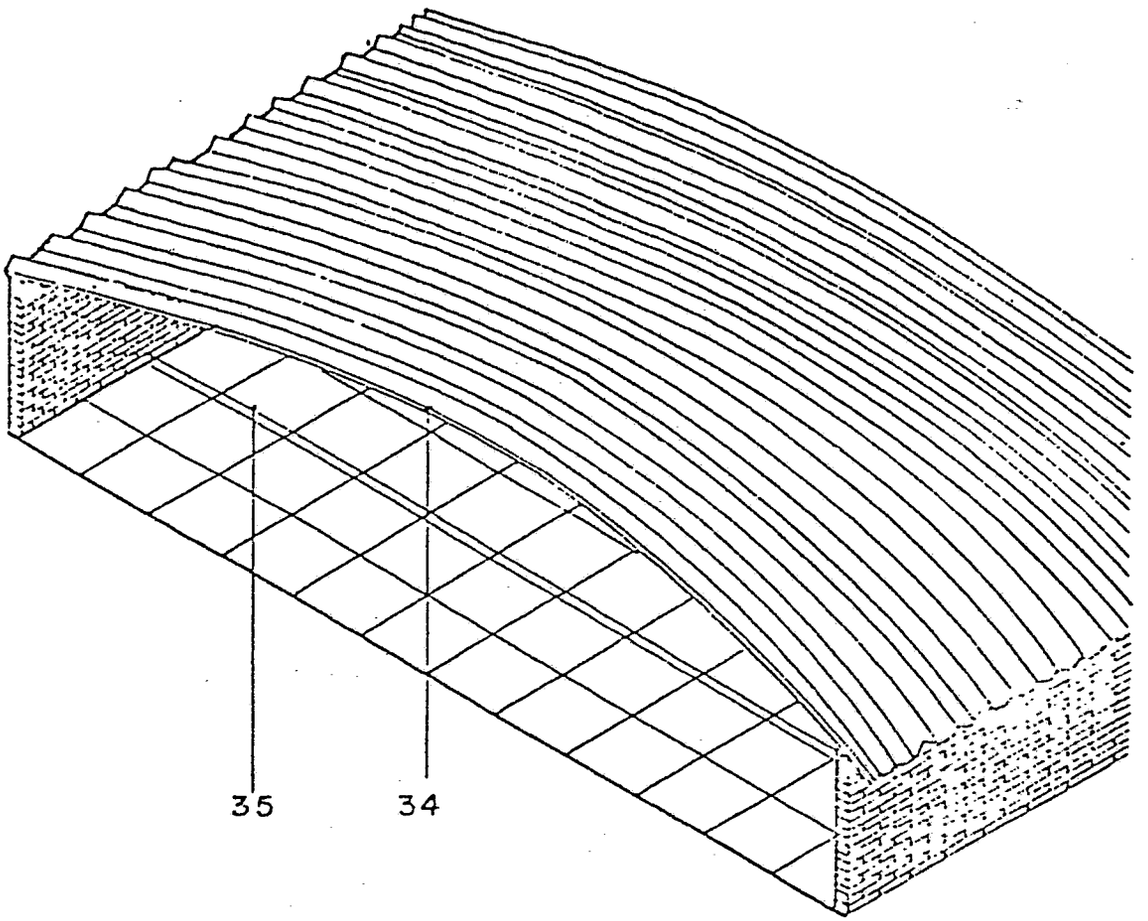

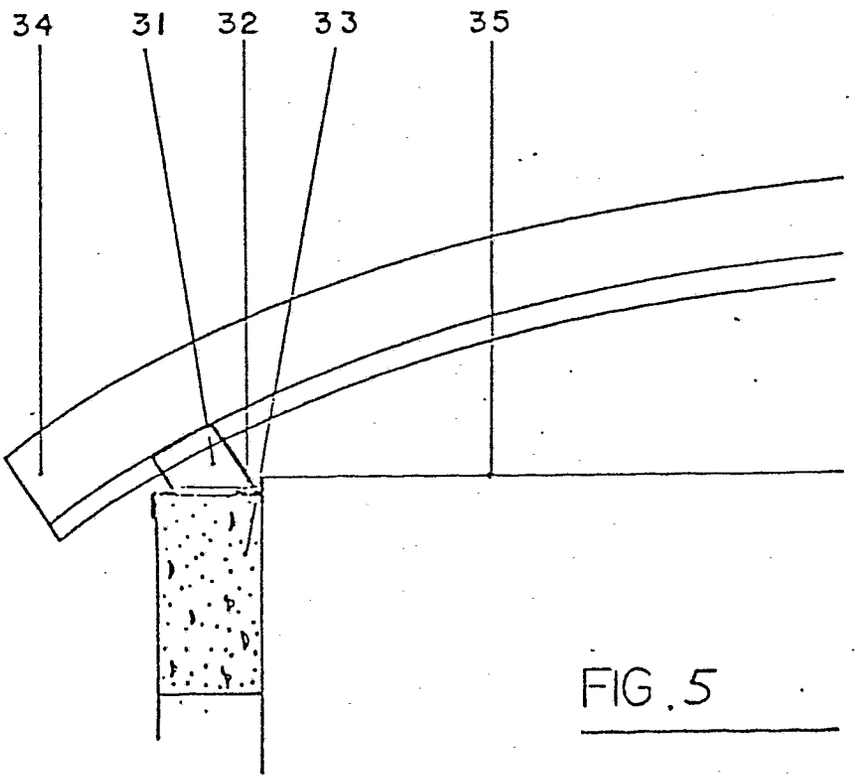

FIG. 5

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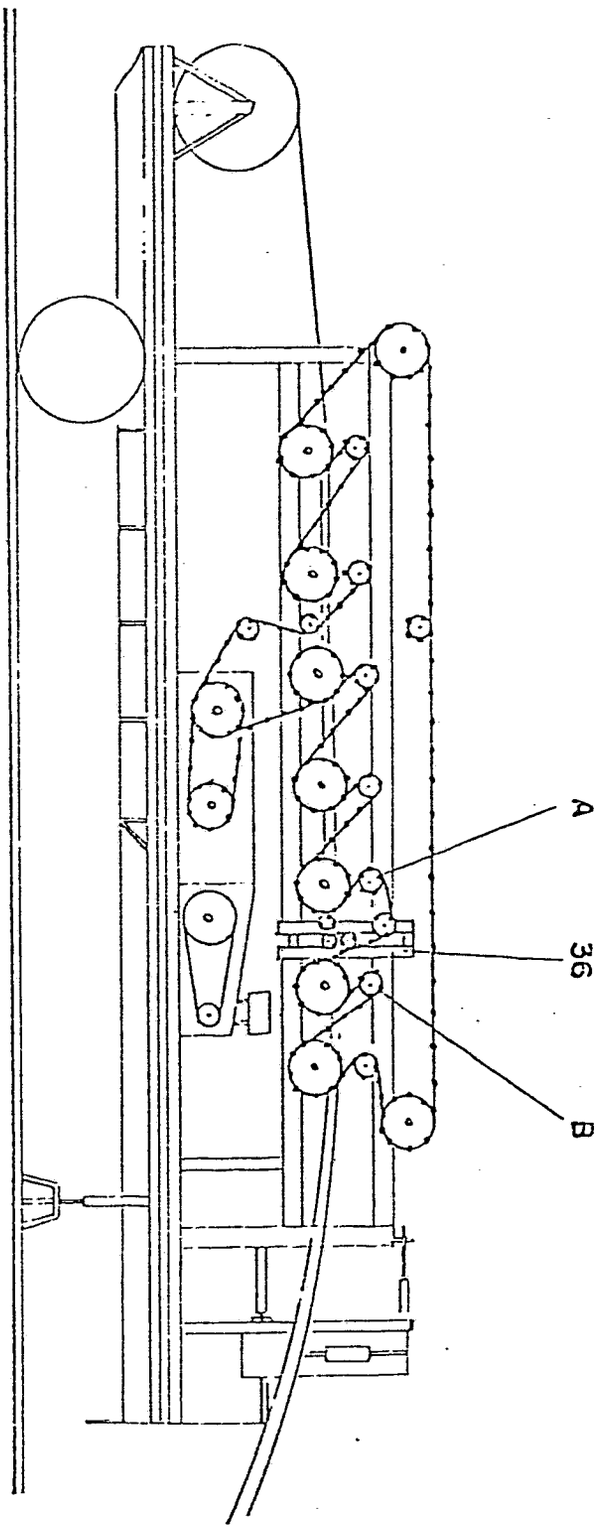

FIG. 6

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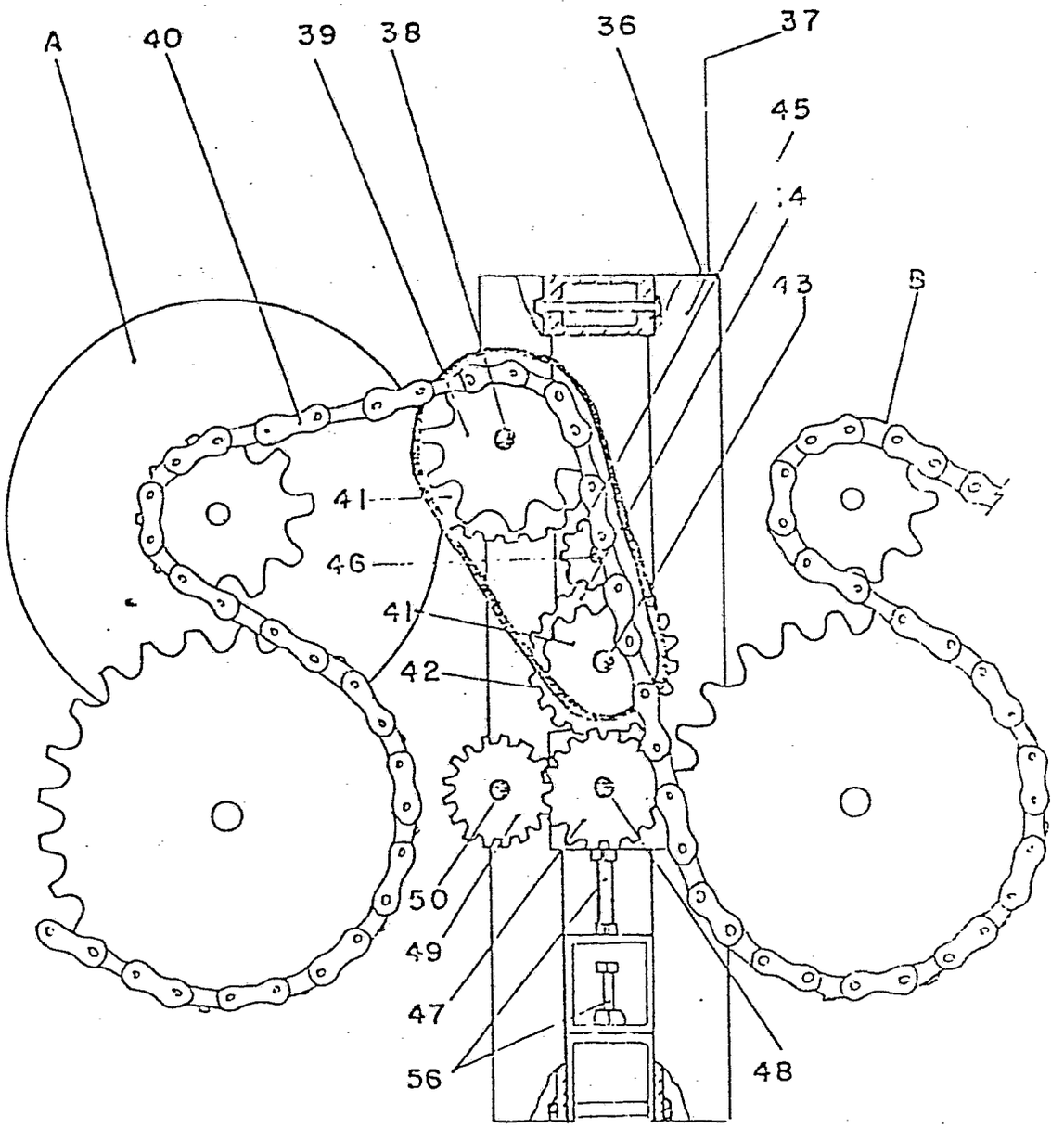

FIG. 7

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FIG.8