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ABSTRACT

A low speed container packaging machine is provided using a plastic carrier (9) to hold them and comprising a conveyor (35) moving containers (42) in double rows introducing them to the carrier applying section, receiving and moving them, a couple of cogwheels (12) to locate them in synchronous position below the jaw plates (11), and thus apply them the carrier (9). The jaws (15) are mounted on the plates (11) spinning on two axes at preset angles (α, β) with respect to the horizontal and vertical planes and located symmetrically with respect to the longitudinal axis of the machine. The plates (11), upon spinning take the carrier strip or fastener from the feed trough (13) and with their jaws (15), stretch them for a 180° run and locate it on the containers and together with a suitably positioned release plate (19), deposit the carrier on the containers. Once the carrier (9) is applied on the containers (42), these enter the cut station in which packages of 2, 4, 6, 8 or more containers are formed by means of a novel cutting system.

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LOW SPEED CONTAINER PACKAGE FORMING MACHINE

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The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

LOW SPEED CONTAINER PACKAGE FORMING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to container packaging machines and more particularly to low speed machines which apply plastic wrapping to containers, making packages easily carried.

Plastic wrappings or holders are widely known and used due to their low cost. This wrapping can be applied by hand on sundry containers (cans, tins, bottler's, etc.) for a great deal of products and materials but because of the high cost of production in the bottling industries for soft drinks, beers, drinking waters, etc., it is not economically feasible to do it by hand and a package forming machine for its easy marketing is required.

In the state of the art there are some container wrapping machines operating at high speed (at least 900 containers/minute), it should be noted that currently in the mark there is no low speed machine (500 containers/minute or less) having the features of the present invention. Following is described briefly the operation of the machines working in a similar way to that described in the present invention.

The machine subject matter of U.S. patent 3,032,944 applies the wrapping by means of a rotary drum on which there are located a series of sliding jaws running on tracks. Their movement is controlled by means of a pair of cams, one each located on each side of the drum, when the drum spins, the jaws slide, opening the carrier to be placed on the cans.

U.S. patent 4,250,682 describes a machine also consisting of a rotary drum with jaws, although differing from the above, only those on one side slide while those on the opposite side remain stationary. As in the prior machine the jaws open while the drum spins, thus opening the carrier to place it on the tin.

In U.S. patent 3,383,823 another machine is described to apply a carrier and having a series of pins catching the carrier, separating to open it and place it on the tins.

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One further machine is described in US patent 4,817,361 consisting of two plates with double jaws provided in the periphery taking the carrier band from a tray and by spinning the plates the carrier opens as said plates spin on axis offset a certain angle with reference to the horizontal plane of the machine. In contrast to the present invention, this machine merely presents an incline, in the vertical plane, of the movement axes between each other, while in the present invention there is an incline in the vertical plane, and one in the horizontal plane, which prevents the jaws from hitting the containers during operation.

These machines have the disadvantage of being noisy, high production costs, relatively large sizes, complex maintenance and construction, very high operation speeds for some applications, difficult mechanic adjustment for the change of package size, as well as more working time for change of size and diameter of the containers. The present invention describes a machine that in the opinion of the inventors avoids these and other drawbacks.

Thus it would be desirable to provide a low speed simple machine to package with plastic carrier different types of containers such as cans, tins and bottles of several capacities and types of materials forming thus totally automatically, packages of 2, 4, 6, 8 or more containers.

The containers subject to packaging by such a machine should include, but not be limited to soft drink beer cans, bottles, juices and preserves. Further, the building materials of these containers can include, but are not limited to, aluminium, plastic or steel.

It would furthermore be desirable to provide a low speed packaging machine having a simpler and more economic manufacture, operation and maintenance. The machine would advantageously attend the current need of a low production speed machine (typically 450 containers/minute) with a low cost of manufacture and maintenance. It would also be useful for the packaging machine to have a relatively simple and silent transmission system as compared to those machines of the state of the art currently existing. That is, the transmission system should be safe, secure and with a low noise index.

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It would also be desirable to provide a machine with a totally automated and flexible system for cutting the plastic carrier, which can be programmed to act upon a certain amount of containers per package without substantial production interruption.

BRIEF DESCRIPTION OF THE INVENTION

According to the present invention there is provided a low speed packaging machine for applying a plastic carrier to a set of containers, including:

conveyor means for conveying a plurality of containers along a predetermined path toward a carrier application station;

carrier reel means for housing a supply of a plastic carrier to be installed upon a set of containers at said carrier application station when said set of containers is conveyed to said carrier application station by said conveyor means;

a pair of carrier applicator plates, respectively having axes about which said pair of carrier applicator plates are rotatable, and disposed adjacent to said carrier application station for receiving said plastic carrier from said carrier reel means and for applying said plastic carrier upon a set of containers disposed at said carrier application station; and

means for mounting said pair of carrier applicator plates such that said rotary axes are inclined, and not co-linear, with respect to each other through means of a first predetermined angle within a vertical plane, and are inclined, and not co-linear, with respect to each other through means of a second predetermined angle within a horizontal plane.

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The preferred machine includes a reel carrier, a feed tray, two plates with jaws, a motor-driven conveyor, a removable device, a driving system, a transmission system, a cutting system and an electric and electronic control device, and caters for a diversity of containers located sideways to form packages 2, 4, 6, 8 or more containers, totally automatically and continuously.

The motor-driven conveyor preferably carries the aligned containers, two by two, one exactly in front of the other, up to two non-metallic, preferably nylon cog or star wheels, spinning in synchronisation with the jaws on the plates. For this operation, two non-metallic, preferably nylon guides are used, which will release the pressure on the containers line and guide said containers toward said star wheels so that the containers are located at the exact position to receive the carrier band.

The plates are preferably two solid circular pieces in which the jaws are mounted which grab and stretch the carrier crosswise as the plates spin. The jaws are held by means of two screws to the plates periphery and are located equally spaced therein. Each plate is mounted on a shaft and its longitudinal axes, being non-collinear and forming between them an angle on the vertical plane from 155° to 175°, preferably 165° and an angle between the same shafts on the horizontal plane from 160° to 180°, preferably 171°. The size of the above referred angles may vary depending mainly on the amount the carrier is to open and the dimensions of the containers, that is height and diameter; these angles will always be lower than or equal to 180°. As can be seen from the description of the state-of-the-art machines, this double incline in the plates is not provided in any of them. The angle formed between the plates driving shafts on the vertical plane makes the plates - through the jaws - open the plastic carrier enough to place this carrier on the containers, while the angle between these shafts on the horizontal plane prevents the containers from

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colliding with the jaws when leading to the carrier-applying position. This angle combination allows the spinning jaw plates to open the carrier crosswise in order to reach the required size and thereafter start the closure so that the carrier is correctly placed on the containers passing below such plates on the conveyor and held by the cog wheels or stars.

It was found that the use of this second angle in combination with the transportation and arrangement system for containers to the carrier application zone, that is to say the plates and nylon star wheels, provides great advantages especially because it prevents containers being mishandled or even exploding as a consequence of the pressure in the containers line before, and in, the carrier application zone. This pressure is created by the required production speed, typically 450 containers per minute. It is estimated that a slower production of 100 containers per minute would not require this type of system; however, due to the fact that the minimum production rate is greater, this combination is necessary. The second angle prevents the jaws from crashing with the containers as well as with the non metallic rails. In other words, this second angle prevents crashes between the jaws of the jaw plates and the containers and non metallic guides as a consequence of using this system to release the pressure in the containers line.

Another great use for the second angle is to prevent the carrier from becoming undone from the jaws before it is applied. It was found that without this second angle the carrier would fall before it was applied and that a greater opening in the jaws deformed this carrier permanently. In fact, it was found, surprisingly, that without this second angle, the carrier - despite being held by the jaws from the area in which it is taken by the jaw plates - fell on the containers before being applied.

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Between both plates and located at the contact level between the carrier and the containers, is preferably located a separating plate which stops the carrier "climbing" again with the jaws forcing their dislodgement. The containers with the carrier or fastener already in place are carried by the conveyor to the cutting station. In this station there is preferably another non metallic cog wheel, controlled by a manually adjustable brake - although an electromagnetic brake or any other type of automatic brake known to the experts may be used. This cog wheel limits the movement of the containers to facilitate the cutting stage and to allow the electron-optical sensor to detect the number of containers that have passed in front of it. The electron-optical sensor can be substituted by an electromechanical switch or similar device.

As already mentioned before, the cutting system preferably includes an electron-optical sensor mounted on the auxiliary frame of the removable device and its function is to detect the passage and number of containers passing in front of it and to deliver a signal which activates a pneumatic electro valve actuating a three-piece nylon plunger which, when descending, centres and separates the containers and two blades which perform the cut to separate the packages in 2, 4, 6, 8 or more containers according to the electronic selector programming. The whole plunger assembly, that is the pneumatic plunger, nylon centering devices and blades or cutters, is preferably mounted on a spring hinge, allowing momentary movement together with the containers and returning to the start position once the cut has been made. This hinge is mounted over the auxiliary frame. The plunger is preferably pneumatic, although - as is evident to an expert in the field - another type of plunger or similar device can be used.

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The machine preferably has a removable device which contains a carrier applying system and a part of the transmission system wholly mounted on a main frame. The design of the main frame removable device has been made in such a way as to obtain the angles and by the relative position between the support bearings of the jaw plates driving shafts. For the first angle, it is obtained by a height difference in the bearing supports of the jaw plates driving shafts and for the second angle, by a shift in the horizontal plane of the central bearings towards the containers feeding area relative to the external bearings.

The transmission system preferably comprises a main system and two secondary systems. The power plant preferably activates the main system by means of a chain and transmits this movement to the secondary systems by means of helical bevel gears. The movement is preferably received by a vertical shaft and is transmitted to the jaw plates driving shafts, also by means of helical bevel gears. The shafts preferably sit on the bearings and the type thereof varies depending on the required assembly.

The secondary transmission systems are preferably identical as to the position of the elements thereof, but they are located at opposite sides of the machine.

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BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of the packaging machine and shows the reel and the carrier in the operating position.

Figure 2 is a perspective view of the area where containers are fed to the machine; the containers move from right to left as indicated by the arrow.

Figure 3 is a front view of the reel carrier and its brake.

Figure 4 is a side view showing the schematic path of the plastic carrier in the machine from the reel to the plates.

Figure 5 is a perspective showing a detail of the entrance of the plastic carrier to the feed tray.

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Figure 5A shows the feed tray and entrance for the jaws.

Figure 6 is a perspective showing how the jaws hold and start opening the carrier or fastener.

Figure 7 is a top view showing the incline angle between the driving shafts of the jaw plates.

Figure 8 is a front view from the entrance of the containers, which shows the incline angle between the driving shafts of the jaw plates.

Figure 8A is a top view of the removable device and the parts it holds.

Figure 9 is a front perspective of the jaw plates showing the helical bevel gears and shaft supports.

Figure 10 is a perspective showing the detail of the central release plate, the stars, the jaw plates and part of a secondary transmission system.

Figure 11 is a perspective showing in detail the area where the plastic carrier is applied to the container.

Figure 12 is a perspective showing the stars and the exit of the containers from the application area.

Figure 13 is a perspective of the main transmission system, one of the secondary transmission systems and the power plant.

Figure 14 is a side view of the secondary transmission system.

Figure 15 is a partial perspective showing the cutting system and a roller guide.

Figure 16 is a perspective of the one piece jaw used in the plates of the present invention; and

Figure 17 is a partial perspective showing the plunger assembly in the cutting position.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows the machine totally assembled, which shows the location of the reel **8**, the plastic carrier **9** and the path thereof through the roller guides **10**, the feed tray **13** which, additionally to guiding the carrier, pre-folds the side ends of the plastic carrier **9** to prevent it from bending inwards and being inadequately captured by the jaws **15** of plates **11**; that is to say that it starts the folding of the ends of carrier **9**, something not done in any the machines of the previous state-of-the-art, once the carrier is folded it is placed on plates **11** with

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jaws **15**. These are one-piece jaws **15**, as shown in Figure 16, and not two or more pieces as previous ones; they have two threaded holes to hold plates **11** by means of screws and two guiding holes to easily and rapidly locate them in position.

As can be seen in Figure 16, the front face is concave and the back upper face is convex so that the carriers take the container shape and open up without breaking. Carrier **9** will be received in this back upper face. The lower back face of the jaw **15** is flat to adapt to the side face of plates **11**.

Figure 2 shows conveyor **35**, running from the entrance of containers **42** to the exit of such containers, already packaged. This is a plastic slats conveyor **5**, well known in the field; it could be built from another type and material. Furthermore, the conveyor includes a stainless steel frame on which the plastic guides **4** are mounted, allowing the side shift of containers **42**. Figure 2 shows the entrance area of conveyor **35** with the container separating plate **3**, dividing the containers in two rows to align them and allow thus their adequate entry to the carrier applying area; on this plate are mounted two reflectors **2**, one on each face of this separating plate **3**, on which the infrared rays of detectors **1** impinge to sense the presence or absence of containers **42** on conveyor **35**.

At the end of the separating plate **3** and already in the carrier applying area, there are two non metallic plates, preferably nylon **17**, see Figures 7, 8A and 9, opening the two rows of containers **42** so that they hit nylon stars **12** tangentially and, with this, reduce the excess pressure between containers **42** on the conveyor. When stars **12** spin, they synchronise the longitudinal movement of containers **42** with the circular movement of plates **11** and jaws **15**, thus applying the carrier **9** exactly on containers **42**.

In the upper part of the machine there is a device shown in Figure 3, wherein the reel carrier **6** can be seen with its brake **7** which controls the reel movement **8**, avoiding rough movement or spin inertia, further giving the required tension to carrier **9** for its correct application to feed tray **13**. This brake **7** is a manually adjustable brake which is comprised of a support and a brake shoe in contact with the reel carrier rotation shaft **6**.

Figure 4 shows the path of carrier **9**. Once out of the reel **8** through the roller guides **10**, it goes into the feed tray **13** which has a double role: in the first place, because of its two-piece design and because the side ends of these pieces are bent upwards allowing carrier **9** to pass between them, it folds the edges of the carrier at the exit of feed tray **13** and, in the second place, it lays this carrier in a

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pair of jaws **15** which at this point are going into the grooves in stainless steel feed tray **13**. This is more clearly appreciated in Figures 5A and 6. It should be noted that all the metallic elements are stainless steel as so stated by sanitary requirements, however it is possible to use another type of metal or material suitably performing the corresponding function. Once the carrier **9** is in place on jaws **15**, the carrier opens - see Figure 6 - as the plates **11** spin clockwise, as seen from the driving system side, that is with the entrance of the carrier **9** on the left side of plates **11**, this opening of the carrier **9** is attained by spinning the plates b with jaws **15** and these being over shafts **16**, angularly shifted with preset angles on the horizontal and vertical planes. The first angle , Figure 8, is between the shafts **16** with reference to the vertical plane and is to obtain the opening of carrier **9**.

Making an analogy between the handles of a clock and the movement of plates **11**, as seen from the opposite side of the main transmission system, at the 1 o'clock position, the jaws **15** take the carrier **9** and when the jaws **15** reach the 7 o'clock position, spinning counterclockwise, the maximum possible opening of the carrier **9** is reached. The carrier **9** between the 7 and 6 o'clock positions, closes because of the angles and , Figures 7 and 8, between the shafts **16** which also help avoid contact between the containers and jaws **15**. When the plate **11** with jaws **15** passes from the 7 o'clock to the 6 o'clock position in its path, the carrier **9** touches the central release plate **19** and this, by its design and location, forces the carrier **9** to lower until it is free from the jaws **15** holding the containers. The central release plate **19** is located between the two rows of containers **42** and between the plates **11**, with jaws **15** and stars **12**, as seen in Figures 10 and 11, and is made from stainless steel.

Once the plastic carrier **9** is applied on the containers **42**, these should keep moving along the conveyor **35** and be received by star **31**, of the cutting station, Figure 15, which includes a brake **32** which reduces the container speed with reference to the slats **5**, and allowing the containers to be stopped in order to lower the plunger with the blades and spacers **36** and the carrier **9** to be cut, Figures 15 and 17, and also so that the infrared rays sensor **34** may accurately detect the passage of containers **42** and send the signal to an electronic counting system; this in turn generates an electric signal activating a pneumatic electro valve **41**, which in turn activates the pneumatic plunger **33** which includes, in its stem, a mechanism with three nylon centering devices and two cutters, Figure 16. These centering devices are used to place the containers **42** before both cutters start cutting the

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carrier **9**. This cutting device is mounted on the auxiliary frame **48** and it is height adjustable by means of eyelets **49** and **50** as seen in Figures 1 and 15. On this same auxiliary frame **48** are mounted the electron-optical sensor **34** and the hinge and plunger **33** as well as the cutting assembly **36**.

The signal produced by the sensor is sent to the electric and electronic control system in which the number of containers in the package has been pre-selected by a simple switch movement, and thus generates an electric signal to the pneumatic electro valve **41**, which in turn activates the pneumatic plunger **33** to cut the carrier **9** and thus obtain 2, 4, 6, 8 or more containers per package as previously selected.

When a change is required in the number of containers per package, this system does not need to carry out any mechanical adjustments as in previous machines which do not even have an electronic cut selection system, nor a cutting station of the electro-pneumatic type described herein.

The power plant is comprised of an electric motor **26** and a reducer **25**, both with the necessary power to move all the machine mechanisms. From this reducer there comes out a shaft in which two sprocket wheels are located. One of these sprocket wheels, by means of a chain, moves the driving axis of the conveyor **35** located at the container packages exit end.

The other sprocket wheel, by means of another chain **27**, moves sprocket wheel **28** and this in turn moves shaft **29** of the main transmission system; this shaft **29** passes below the conveyor **35** towards the opposite end to transmit the movement to the secondary transmission system. Bear in mind that both secondary systems are identical. As can be seen in Figures 1 and 14, the shaft **29** is held by two floor self-aligning bearings fastened to the conveyor frame **35**. On the shaft **29** there are mounted two helical bevel gears **21**, one at each side of the conveyor **35**. Figures 13 and 14 show all the above on one side of the conveyor. Such secondary transmission is symmetrical to the other side of the conveyor. Said helical bevel gears **21** are coupled in pairs, each pair forming a straight angle, that is each gear **21** is made at 45°. As can be seen in Figures 13 and 14, each shaft **20** is held at the lower part by a floor bearing **30**, and at the upper end by a wall bearing **24**, fixed to the main frame of the removable device **44**, Figure 12. In the middle part of each shaft **20**, that is at the height of the containers, there is mounted a pair of non metallic, preferably nylon, stars **12**, each pair fastened by means of three screws with spacers **22** equally spaced and keeping the pair of stars **12** totally parallel, as

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seen in Figure 12. These stars **12** hold and synchronise the containers' movement with respect to plates **11** with jaws **15**, to accurately position them at the required position for the carrier **9** to be applied.

Each star **12** has semi-circular slots allowing the peripheral profile of one to match the other, see Figure 12, as well as to synchronise the stars **12** position, with jaws **15** in plates **11**. At the upper end of shafts **20** there are located two helical bevel gears **14**, with the angle allowing their coupling with the gears **14** of driving shafts **16** which move plates **11** with jaws **15**. The two shafts 16 are mounted on two floor self-aligning bearings **18** and **18A**, joined to the main frame **39** of the removable device **44**. To mechanically couple the driving shafts **16** to the plates **11** with jaws **15**, a bridle **43** is used per each plate **11**. The bridles **43** are mechanically coupled to the driving shafts **16** of plates **11** with jaws **15** by means of a wedge and a stud bolt which prevents any vertical movement of the shafts **16**; the bridles **43** in turn hold the plates **11** by means of three screws which pass though three concentric semicircular slots in said bridles which allow a circular adjustment of the plates **11** as shown in Figure 6. It must be pointed out that the plates **11** are mounted and held to the bridles **43**. The plates **11** have slots to reduce their weight as shown in Figure 1.

As can be seen from the above description and from Figures 1 to 14, the transmission movement between the shafts is carried out by means of helical bevel gears instead of the traditional chain-sprocket wheel system used in previous machines. This provides a great simplicity to the system, at the same time reducing manufacturing costs, the size and weight of the machine and the noise during operation.

The frame **39** of the removable device **44** holds the carrier **9** applying equipment, that is support **37**, of the support bearings **10**, the support **38** of the feed tray **13**, the floor bearings **18** and **18A** of shafts **16**, the plates **11** with jaws **15**, the wall bearings **24**, of shafts **20**, the helical bevel gears **14** and also the central release plate **19**. This frame **39**, mounted on four poles **23**, is held by four screws with nut **40**, which allow height adjustment as required by the size of the containers. Given the design of frame **39** and its mounting on poles **23**, it is very simple to withdraw from the machine and substitute it by another previously set to the required container size when necessary. This means that the screws with nut **40** have a double role of holding the frame **39** of the removable device **44** and to adjust the height with reference to the containers **42**. As will be seen further ahead, there is a

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need to modify this height when changing the height of the container **42** to be packaged.

The frame **39** of the removable device **44** is built with conventional stainless steel structural elements welded to each other, although another type of material with similar mechanical strength and corrosion strength features can be used. As previously mentioned, the angle is obtained by placing the support structural elements for the bearings **18** and **18A** on the horizontal plane at different levels, central structural element **46** of the removable device **44** on the longitudinal centre of the machine for the bearings **18A** on a certain level and the external structural element **47** of the removable device **44** on an upper level for the bearings **18** holding, between them, the driving shafts **16** and the helical bevel gears **14** of the plates **11** with jaws **15**, as results from analysing Figure 9. With reference to the second angle from Figures 7 and 8A, it can be noted that this angle is obtained by making the axes of bearings **18** and **18A** non collinear on the horizontal plane. The lower structural element **45** holds the wall bearings **24** and the support **38** of the feed tray **13**, the central structural element **46** holds the central bearings **18A** and the central release plate **19**, the upper structural element holds the external bearings **18** and the roller carrier guides **10** and furthermore, it holds by one end, the auxiliary frame **48** of the cutting system by means of three screws and eyelets **49**.

The removable device **44** as can be seen from the above description, is comprised of the metallic frame **39** built with conventional structural elements as was previously mentioned, the support **37**, the roller guides **10**, the support **38**, the feed tray **13**, the floor bearings **18**, the shafts **16**, the plates **11**, the jaws **15**, the wall bearings **24**, the shafts **20** and also the central release plate **19**.

When there is a need to modify the machine by changes in the size of the container and at any time the machine must be used with another type of different size container, the following procedures are to be carried out depending on the type of container:

a) with the diameter size change on the cap of container **42** and same body diameter:

- adjustment of the distance between the plates **11** without varying the angles.

- the feed tray **13** is changed, suitable for the new plastic carrier **9**.

b) if the height of the containers is changed and the container **42** cap and body diameters remain unchanged:

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- the frame **39** is levelled with the four screws with nut **40**, on poles **23**.
- the cutting station is levelled (auxiliary frame).

c) if change is in body and cap diameter of the container:

- the removable device **44** is replaces.
- the stars **12** are changed.
- blades and spacers **36** are substituted.

d) if the change is in the height and diameter of container **42**:

- procedure c) is carried out.
- next, procedure b) is carried out.

None of these changes or conversion procedures exceeds 90 minutes in working time, that is they are very easy and fast, as well as more economical in cost, different from the machines of the already described patents which require from one to three working days to carry out some modification in the format or conversion because of a change in the dimensions of the container, and also a difference in cost which goes well over the total cost of the machine presented in this patent application.

To control the machine movements and sequence, and to synchronise the function sensors with these movements, an electric and electronic control system is used, mounted on a panel in which are also located the light indicators and buttons. This control panel (not shown) generates the electrical signals of the motor **26**, of the electro valve **41**, of the light indicators (not shown) and receives the signals for the On, Start, Stop and Speed buttons of the machine as well as the signals of sensor **1**, of security switches **2**, of the doors (not shown) and the electron-optical sensor **34** which detects the number of containers **42** and sends the signal to the control panel so that it actuates the electro valve **41** in the cutting system.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A low speed packaging machine for applying a plastic carrier to a set of containers, including:

conveyor means for conveying a plurality of containers along a predetermined path toward a carrier application station;

carrier reel means for housing a supply of a plastic carrier to be installed upon a set of containers at said carrier application station when said set of containers is conveyed to said carrier application station by said conveyor means;

a pair of carrier applicator plates, respectively having axes about which said pair of carrier applicator plates are rotatable, and disposed adjacent to said carrier application station for receiving said plastic carrier from said carrier reel means and for applying said plastic carrier upon a set of containers disposed at said carrier application station; and

means for mounting said pair of carrier applicator plates such that said rotary axes are inclined, and not co-linear, with respect to each other through means of a first predetermined angle within a vertical plane, and are inclined, and not co-linear, with respect to each other through means of a second predetermined angle within a horizontal plane.

2. A machine according to claim 1, further including:

a feed trough for guiding said plastic carrier toward said pair of carrier applicator plates and for prefolding said plastic carrier prior to engagement of said plastic carrier by said pair of carrier applicator plates.

3. A machine according to claim 1 or 2, further including:

drive means, for rotatably driving said pair of carrier applicator plates, including a pair of shafts which are operatively connected to said pair of carrier applicator plates along said axes of said plates.

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4. A machine according to claim 3, wherein:

said shafts and said axes of said pair of carrier applicator plates are inclined with respect to each other in the range of 160° to 180° in the horizontal plane and from 155° to 175° in the vertical plane.

5. A machine according to claim 4, wherein:

said axes are inclined with respect to each other in the horizontal plane through means of said second predetermined angle of 171° and with respect to each other in the vertical plane through means of said first predetermined angle of 165°.

6. A machine according to any one of claims 3 to 5, further including:

bridle means for operatively connecting said carrier applicator plates to said driving shafts.

7. A machine according to claims 3 to 6, further including:

a support frame;

said driving shafts respectively pass through said pair of carrier applicator plates; and

a pair of bearings are operatively connected to opposite ends of each one of said driving shafts wherein one of said pair of bearings, operatively connected to a first end of one of said driving shafts and disposed adjacent to a respective one of said carrier applicator plates, is located upon a first elevational level of said support frame and at a substantially central portion of the machine, while the other one of said pair of bearings, operatively connected to a second end of said one of said driving shafts disposed remote from a respective one of said carrier applicator plates, is located upon a second elevational level of said support frame so as to accommodate said inclination of said driving shafts within said vertical plane.

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8. A machine according to claim 7, wherein:

said pair of support bearings for each one of said driving shafts are disposed within different horizontal planes with said other one of said pair of bearings, disposed remote from said respective one of said carrier applicator plates, being disposed at a higher elevational level than said one of said pair of bearings disposed adjacent to said respective one of said carrier applicator plates.

9. A machine according to claim 7 or 8, wherein:

said pair of support bearings for each one of said driving shafts are disposed within different vertical planes with said other one of said pair of bearings, disposed remote from said respective one of said carrier applicator plates, being disposed downstream of said one of said pair of bearings, disposed adjacent to said respective one of said carrier applicator plates, as considered in the conveyance direction of the containers.

10. A machine according to any preceding claim, further including:

one-piece jaw means, fastened to said carrier applicator plates for enlarging said plastic carrier in order to permit said plastic carrier to be mounted upon said set of containers.

11. A machine according to any one of claims 7 to 9, wherein:

said support frame is located at said carrier application station; and

said support frame is adjustably mounted upon said machine by four nut-screw fastening elements.

12. A machine according to claim 3, wherein said drive means further includes:

a drive motor;

a drive shaft operatively connected at one end thereof to said drive motor; and

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a pair of helical bevel gears respectively interconnecting said motor drive shaft and each one of said shafts connected to said carrier applicator plates.

13. A machine according to any preceding claim, further including:

means, disposed at a cutting station, for cutting said plastic carrier after said plastic carrier has been applied to a predetermined number of containers;

means for counting said containers as said containers pass through said cutting station; and

control means for controlling the movements of cutting means, when a preset number of said containers has passed through said cutting station, as determined by said counting means, such that said plastic carrier can be cut by said cutting means in order to form a container package comprising a predetermined number of containers.

14. A machine according to any one of claims 3 to 9, wherein said drive means further includes:

a drive motor;

a reducer operatively connected to said drive motor;

a primary transmission system operatively connected to said reducer; and

a pair of secondary transmission systems respectively connected at first ends thereof to said primary transmission system and respectively connected at second ends thereof to said pair of shafts which are operatively connected to said pair of carrier applicator plates.

15. A machine according to claim 14, wherein:

said secondary transmission systems are identical to each other and are located upon opposite sides of said machine.

16. A machine according to claim 14 or 15, wherein:

said primary transmission system includes a first sprocket wheel operatively connected to said reducer, a second sprocket wheel, a chain

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operatively interconnecting said first and second sprocket wheels so as to transmit rotary drive from said drive motor, said reducer, and said first sprocket wheel to said second sprocket wheel, a horizontally disposed shaft operatively connected to said second sprocket wheel so as to be driven thereby, and a pair of helical bevel gears respectively mounted adjacent opposite ends of said horizontally disposed shaft; and

each one of said secondary transmission systems includes a vertically disposed shaft, a first helical bevel gear disposed upon a lower end portion of said vertically disposed shaft and engaged with a respective one of said pair of helical bevel gears disposed upon said horizontally disposed shaft of said primary transmission system, a second helical bevel gear disposed upon an upper end portion of said vertically disposed shaft, and a third helical bevel gear mounted upon said carrier applicator plate shaft and engaged with said second helical bevel gear disposed upon said upper end portion of said vertically disposed shaft.

17. A machine according to claim 16, wherein each one of said secondary transmission systems further includes:

a pair of bearings disposed adjacent said upper and lower ends of said vertically disposed shaft.

18. A machine according to claim 16 or 17, wherein:

said horizontally disposed shaft of said primary transmission system is disposed beneath said conveyor means.

19. A machine according to any one of claims 16 to 18, further including:

a pair of vertically spaced star plates disposed parallel with respect to each other and mounted upon each one of said vertically disposed shafts of said secondary transmission systems at an elevation corresponding to that of said containers being conveyed for synchronizing the movement of said containers with that of said carrier applicator plates; and

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a plurality of spacers interposed between said pair of vertically spaced star plates for fixedly maintaining said star plates in their vertically spaced, parallel positions with respect to each other.

20. A machine according to claim 1, further including:

a cutting station;

conveyor means for conveying a plurality of containers to said cutting station;

container counter means for counting the number of containers that have been conveyed to said cutting station and for outputting a signal when a predetermined number of containers conveyed to said cutting station has been counted;

means for inputting into said container counter means a predetermined number of containers to be included within a particular package of containers;

detector means for detecting the passage of said containers toward said cutting station and for transmitting a signal, corresponding to the passage of each container toward said cutting station, to said container counter means such that said container counter means can count the number of containers that have been conveyed to said cutting station;

cutting means disposed at said cutting station for cutting said plastic carrier; and

means for receiving said output signal from said container counter means and for activating said cutter means when said container counter means has counted a predetermined number of containers to be included within a package of containers such that said cutter means can cut said plastic carrier at a location thereof so as to include within said package of containers said predetermined number of containers.

21. A machine according to claim 20, wherein:

said detector means includes an optoelectronic detector which detects the passage of said containers towards said cutting station and transmits said signal to said container counting means.

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22. A machine according to claim 20 or 21, wherein said cutter means includes:

a cutter element; and

a plunger assembly having said cutter element mounted thereon and including an extensible-contractible plunger for moving said cutter element toward and away from said plastic carrier so as to perform a cutting operation with respect to said plastic carrier.

23. A machine according to any one of claims 20 to 22, wherein said conveyor means includes:

a non-metallic star having configured portions for accommodating said containers; and

brake means connected to said non-metallic star for reducing the speed of said containers as said containers approach said cutting station.

24. A low speed packaging machine to apply plastic carriers to containers substantially as herein described with reference to the accompanying drawings.

DATED: 1 September, 1999
PHILLIPS ORMONDE & FITZPATRICK
Attorneys for:
ILLINOIS TOOL WORKS, INC.

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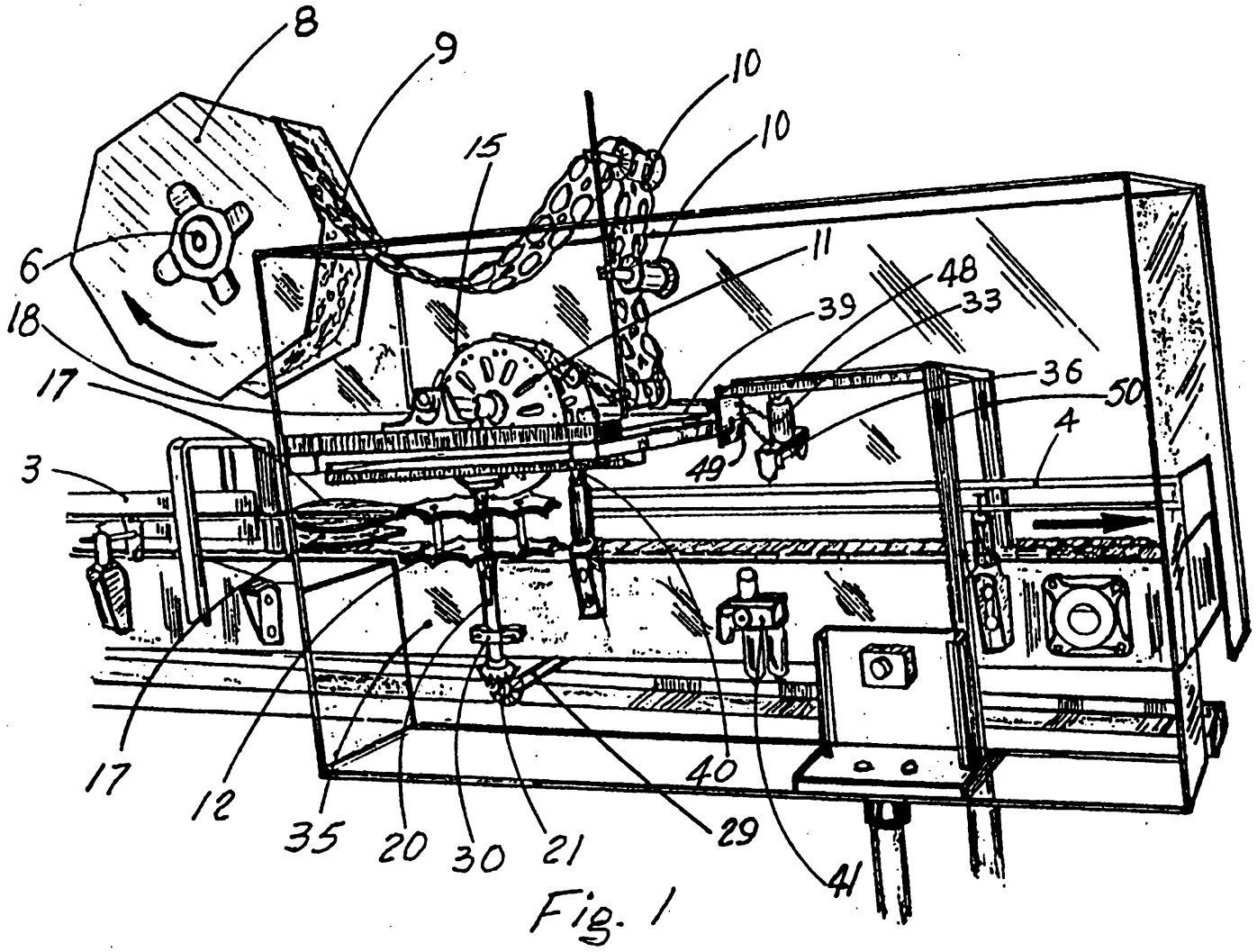


Fig. 1

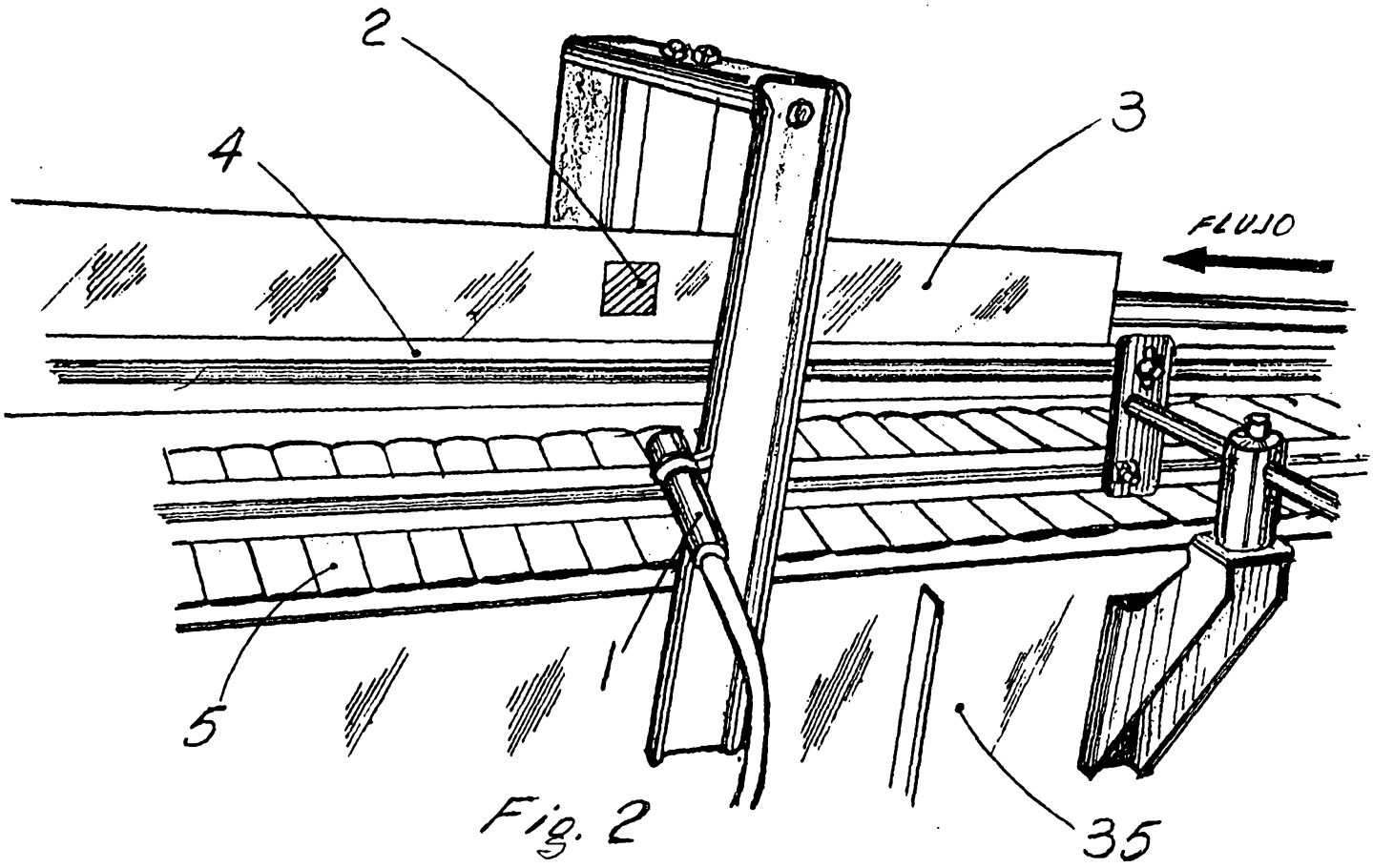


Fig. 2

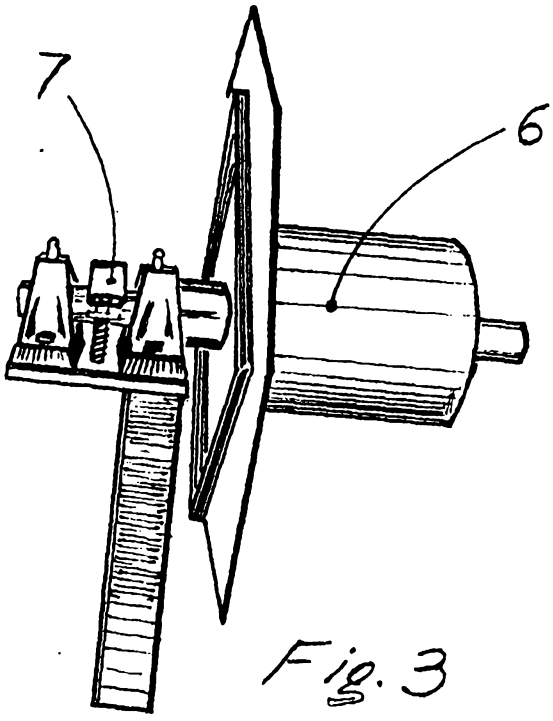


Fig. 3

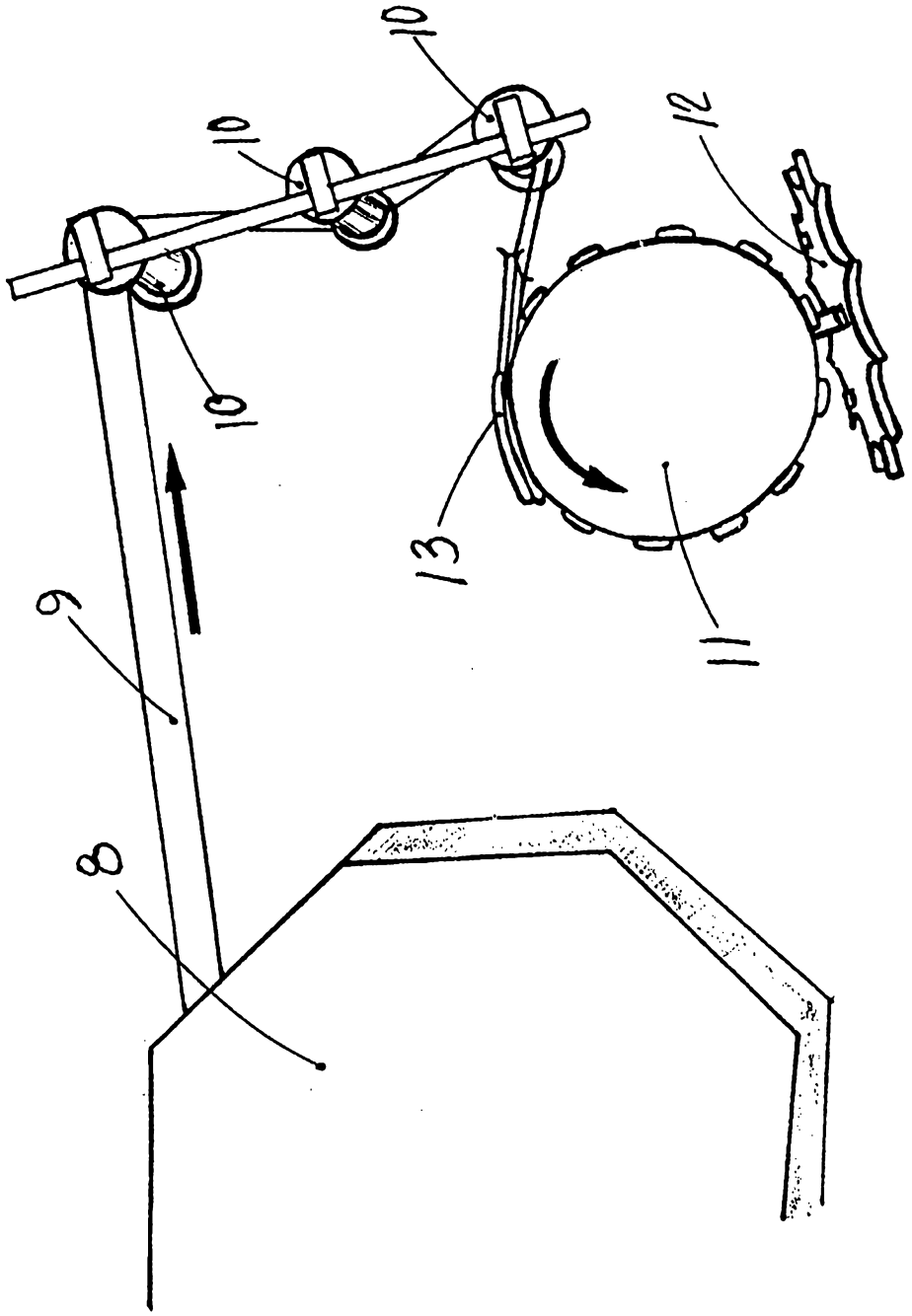


Fig. 4

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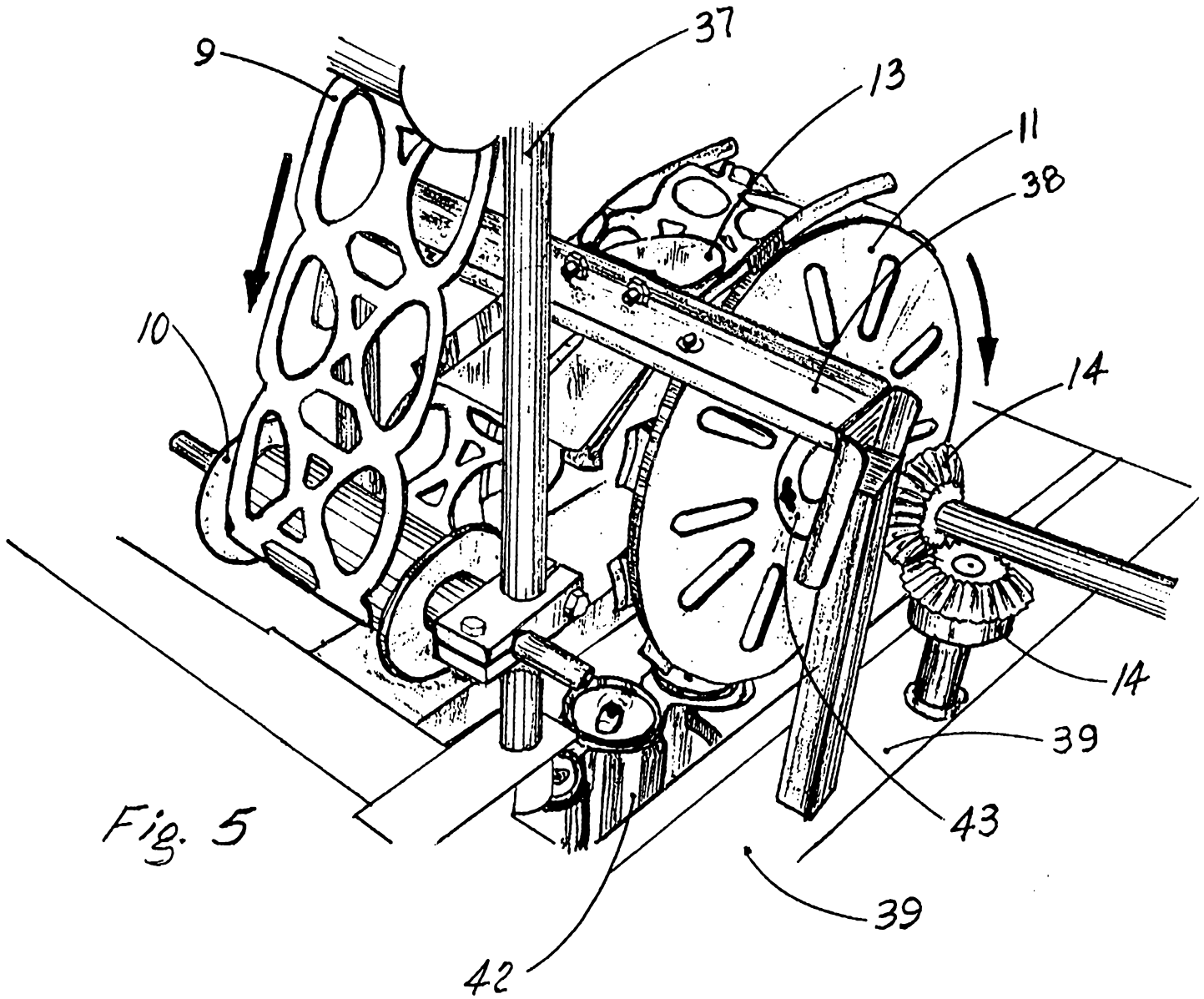


Fig. 5

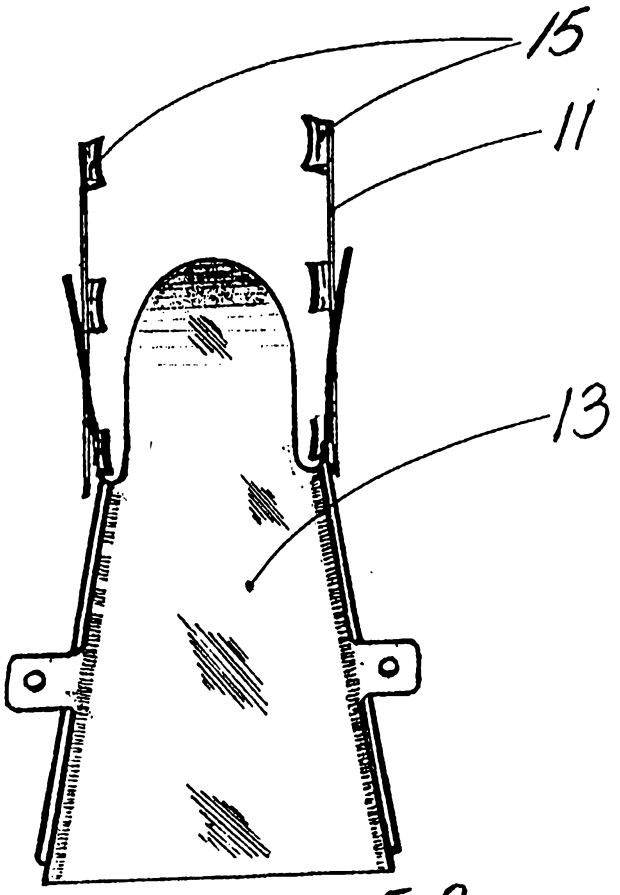


Fig. 5-A

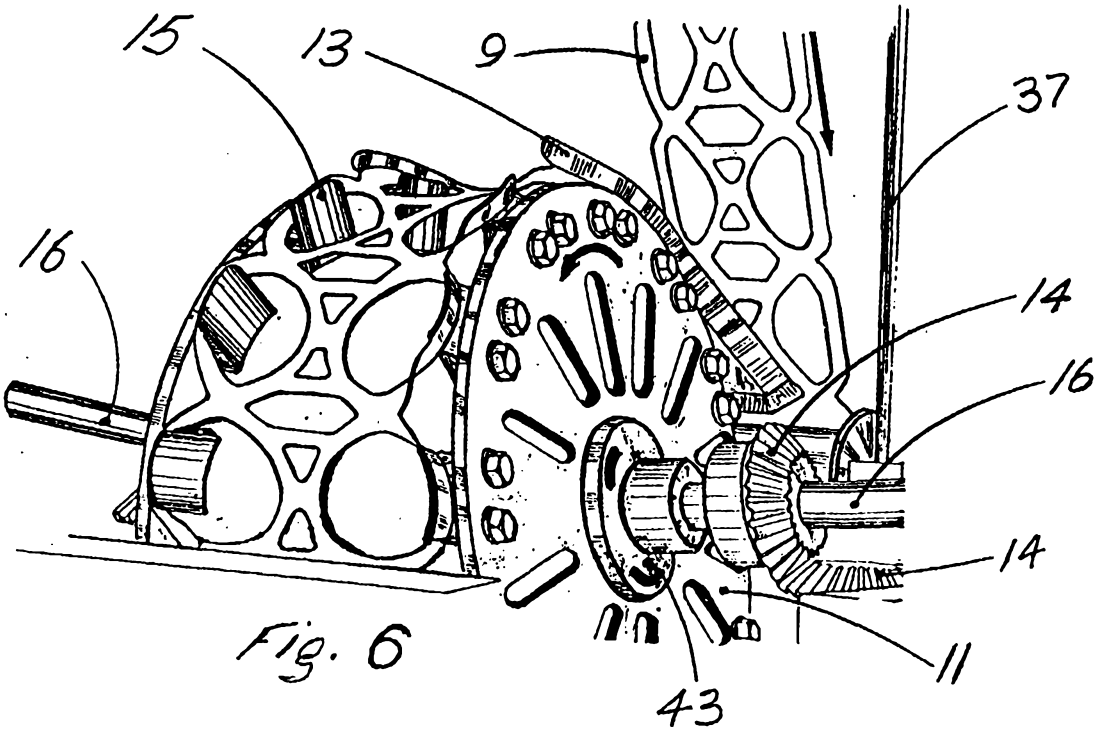


Fig. 6

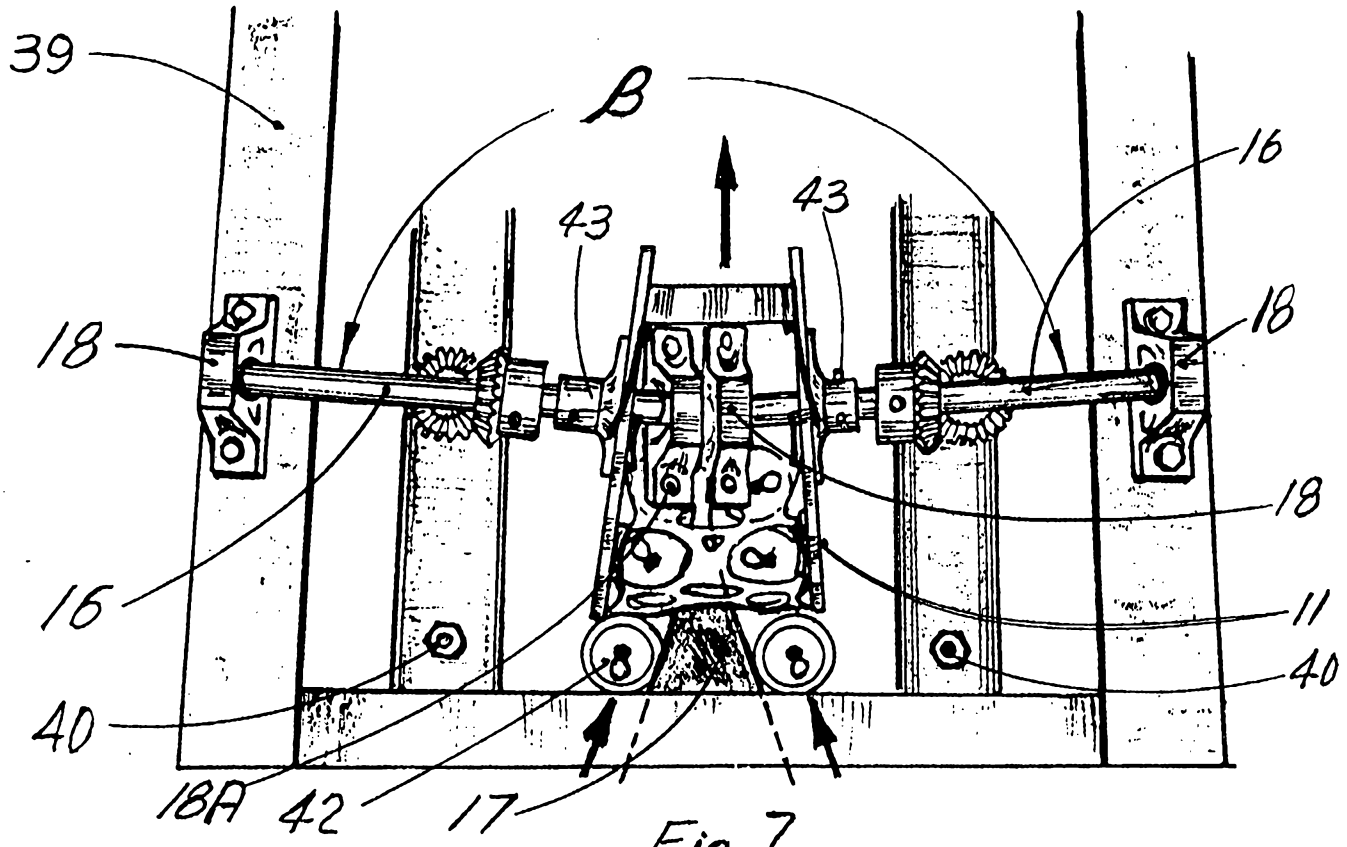


Fig 7

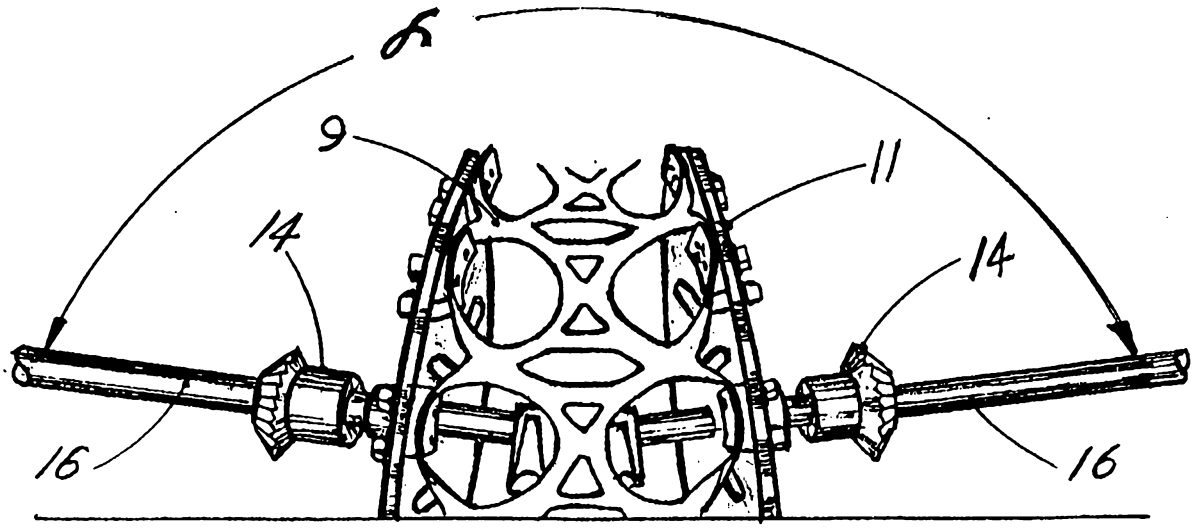


Fig. 8

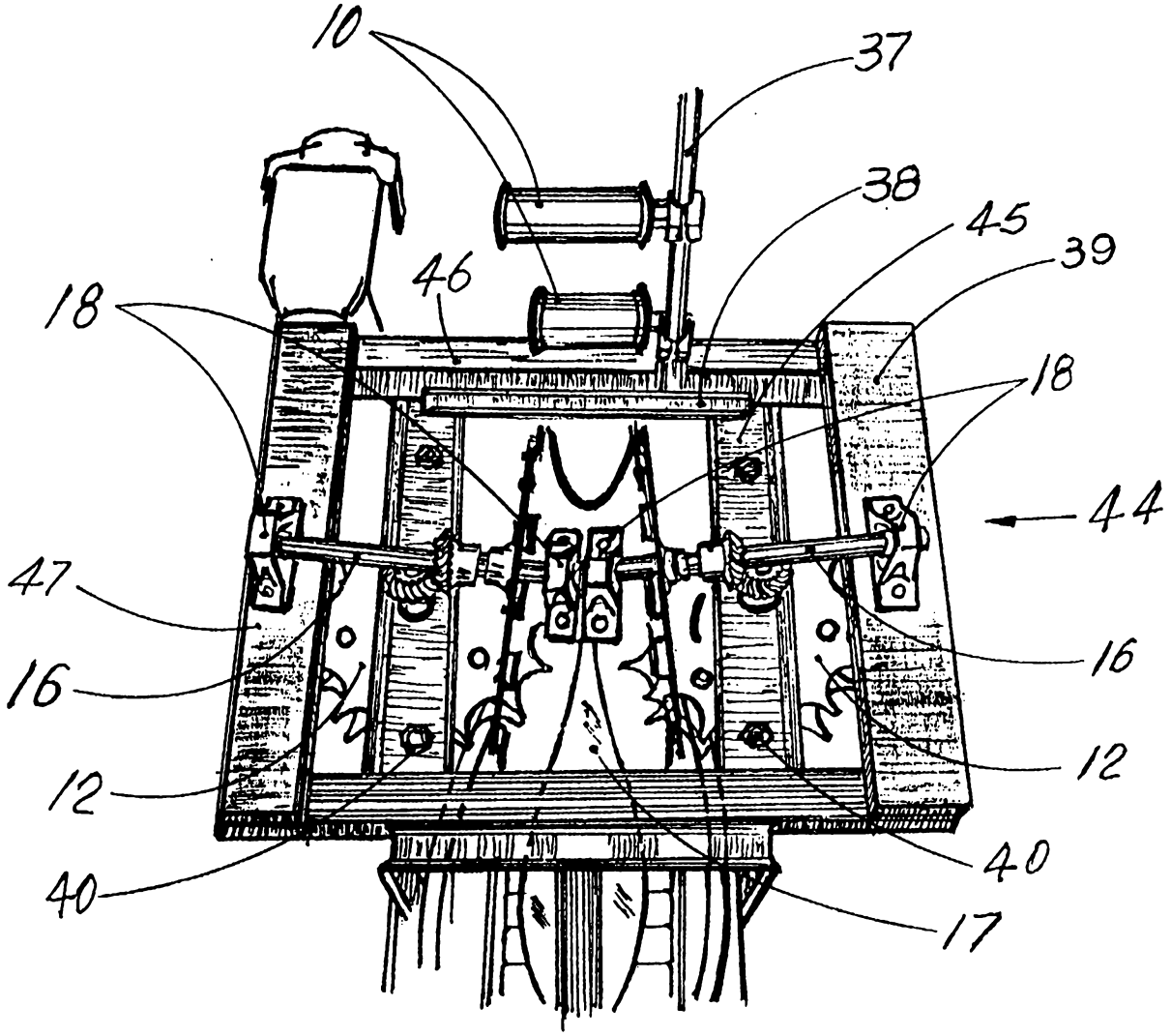


Fig. 8A

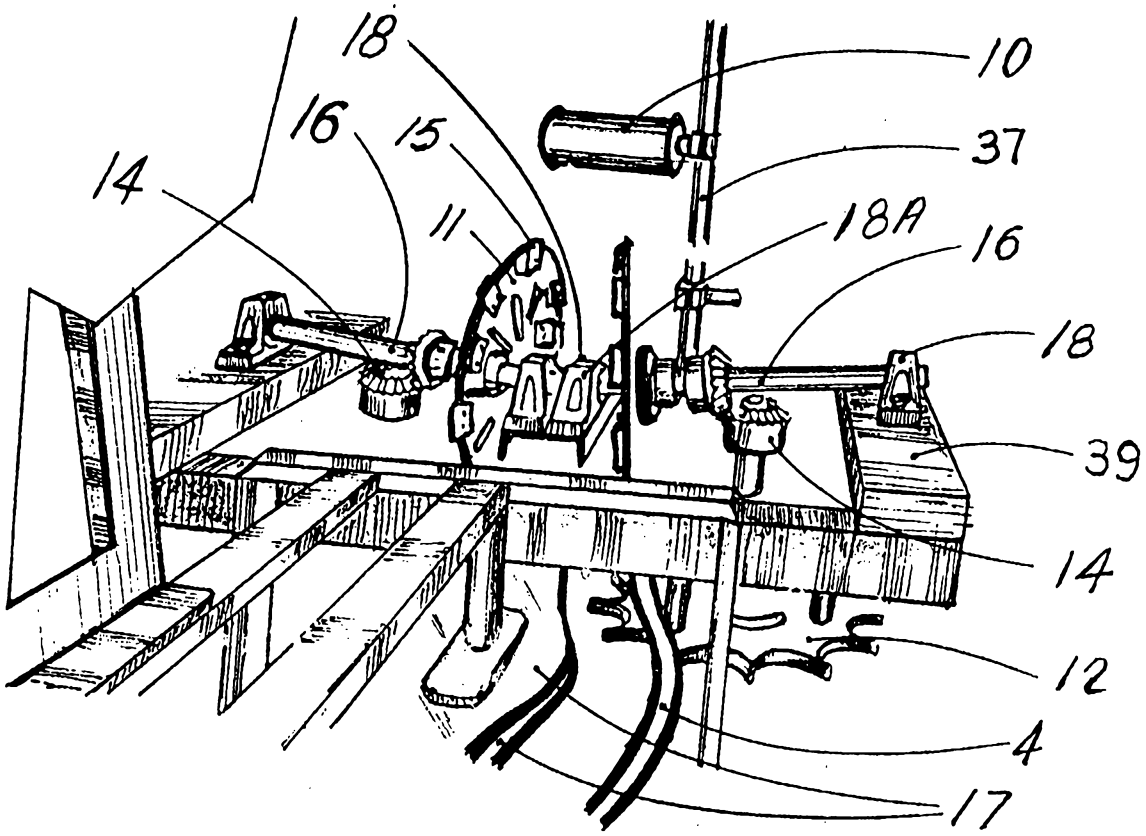


Fig. 9

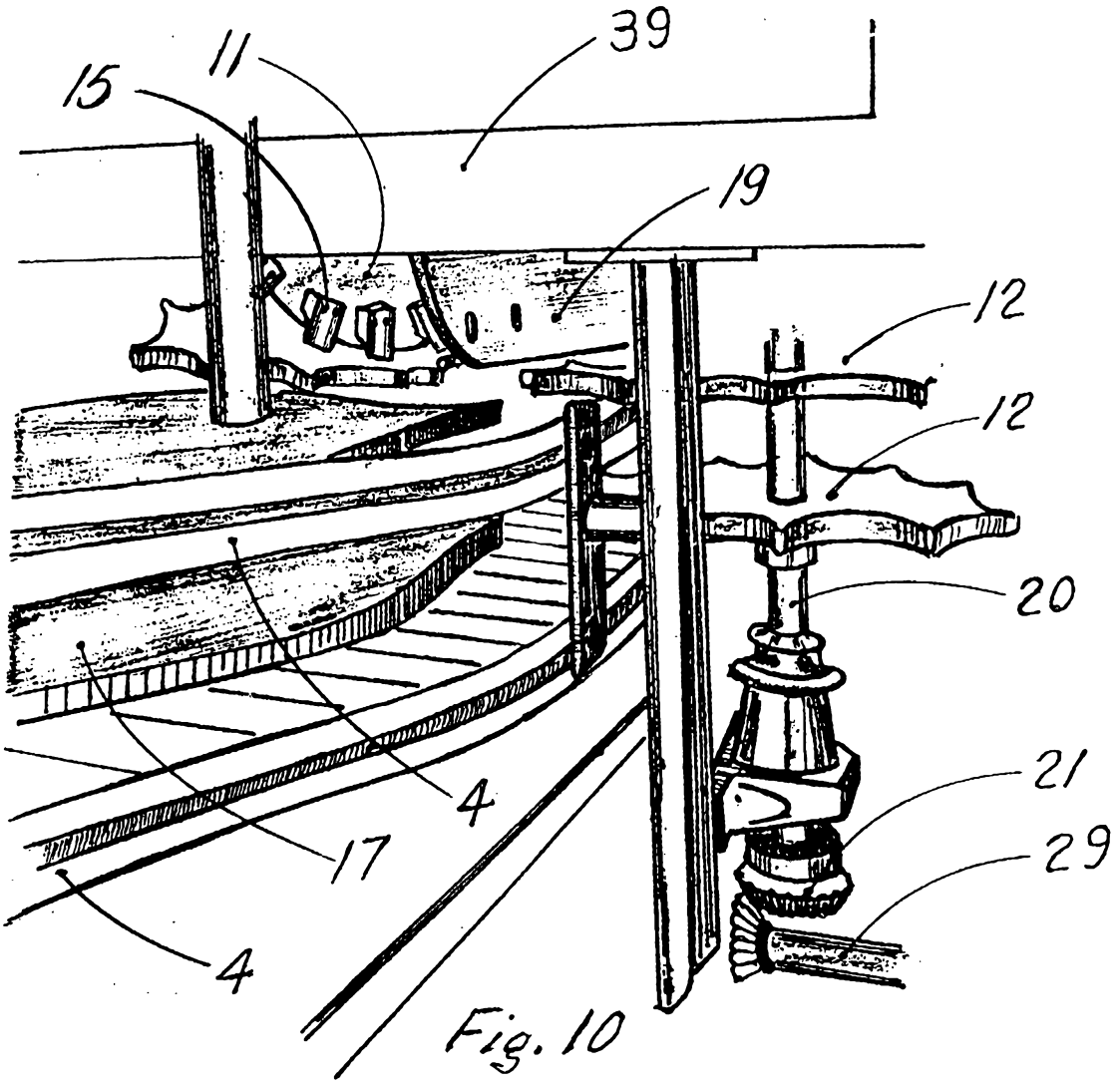


Fig. 10

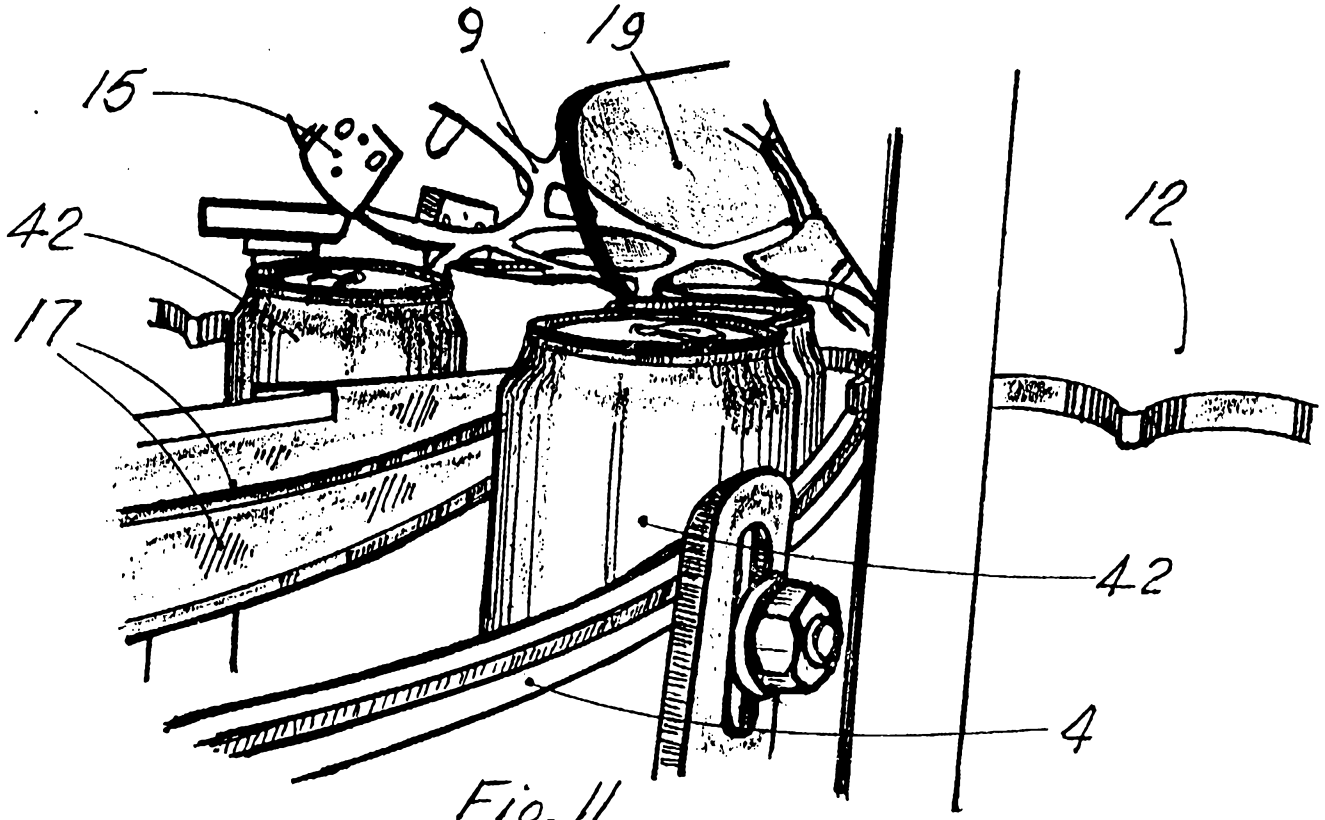


Fig. 11

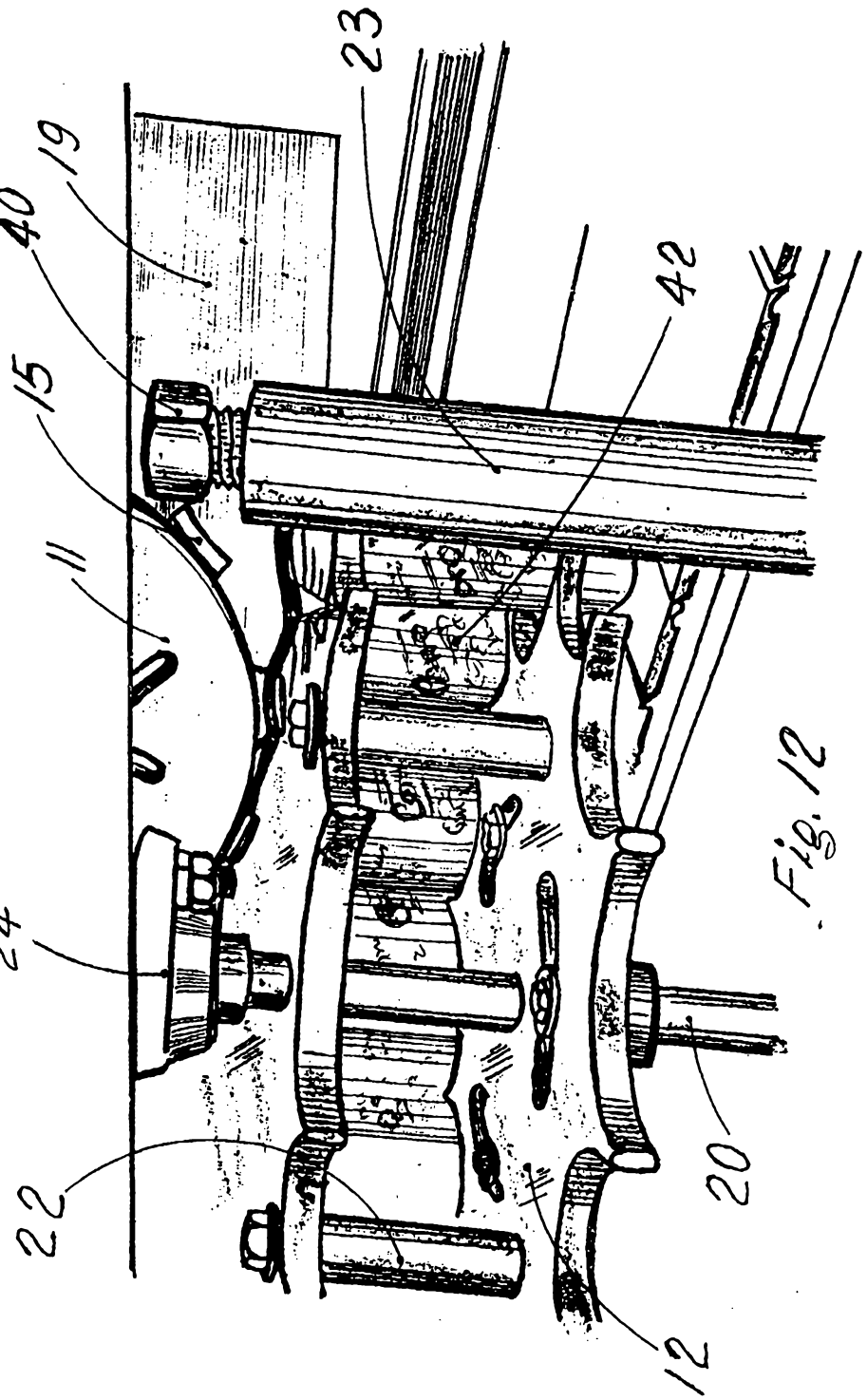


Fig. 12

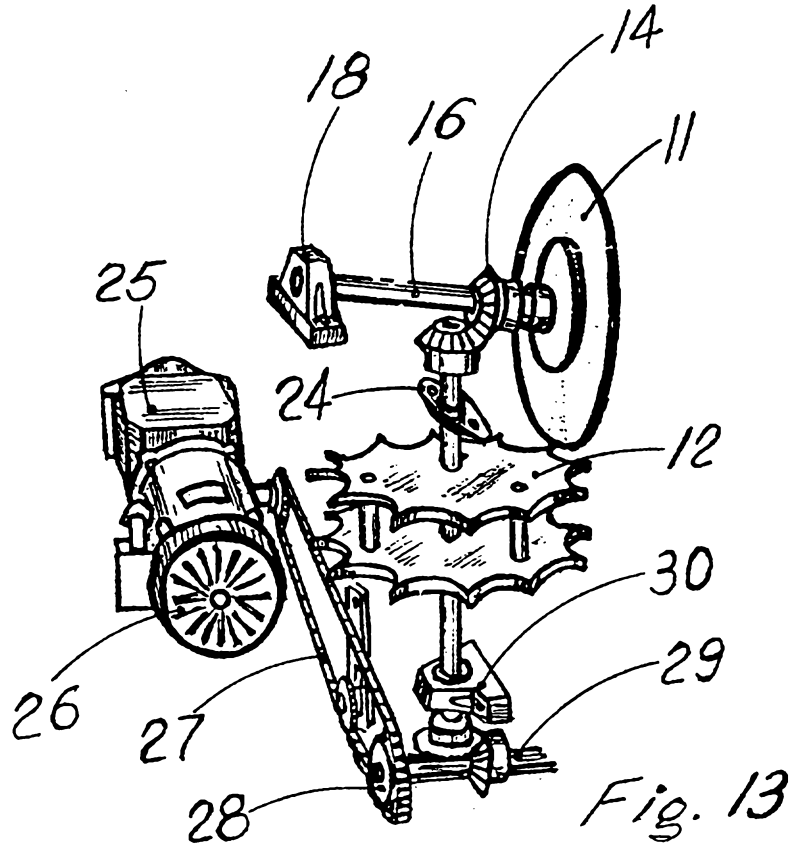


Fig. 13

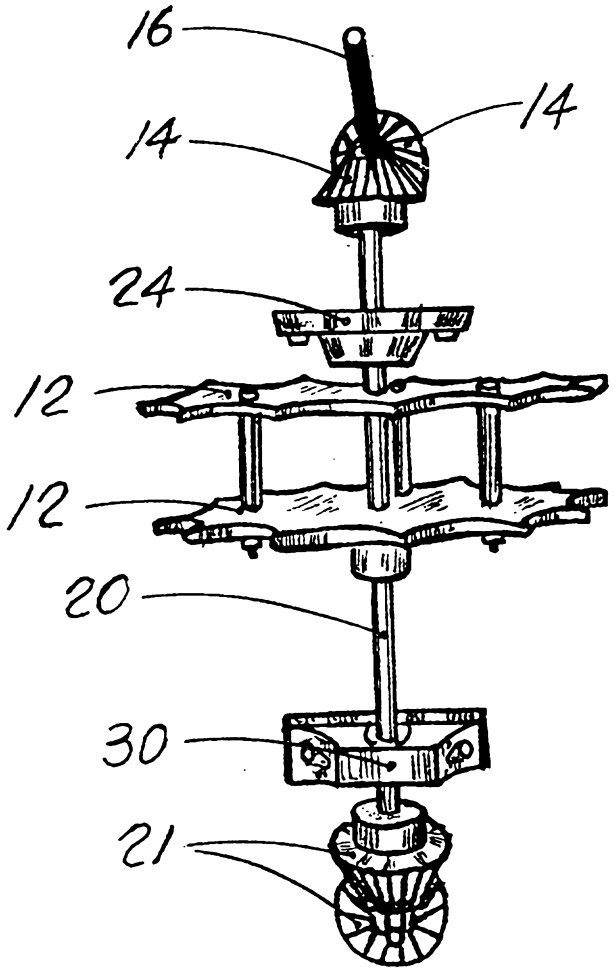


Fig. 14

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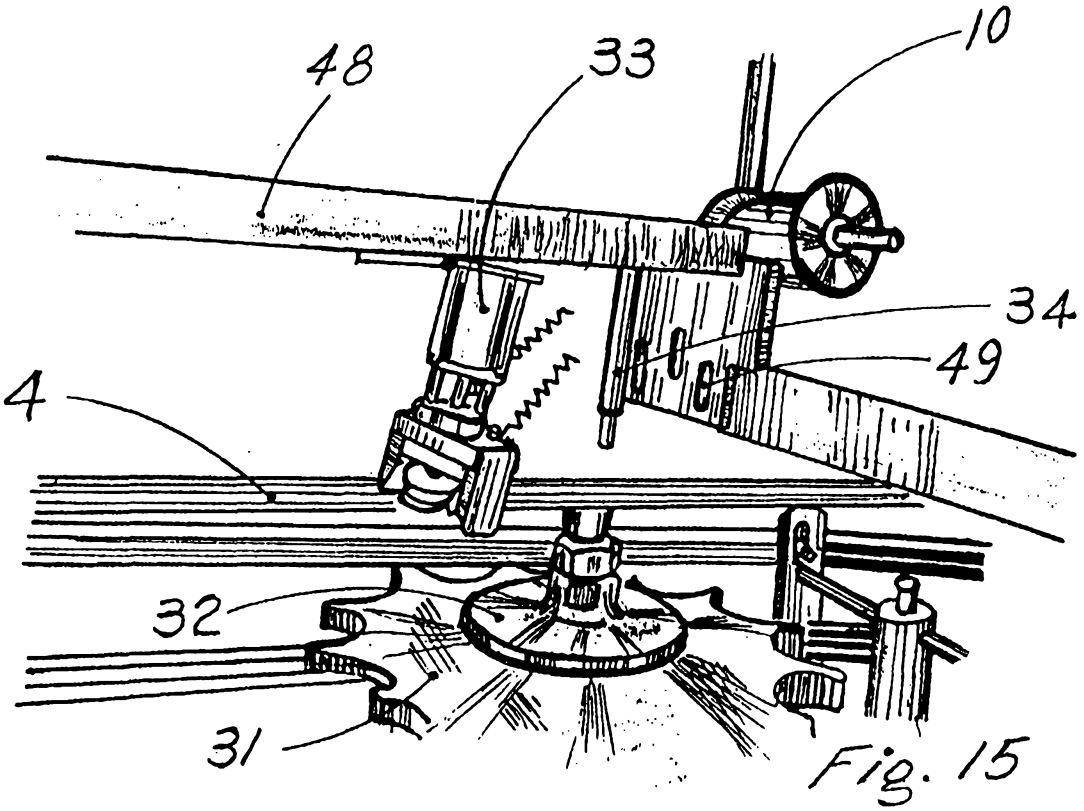


Fig. 15

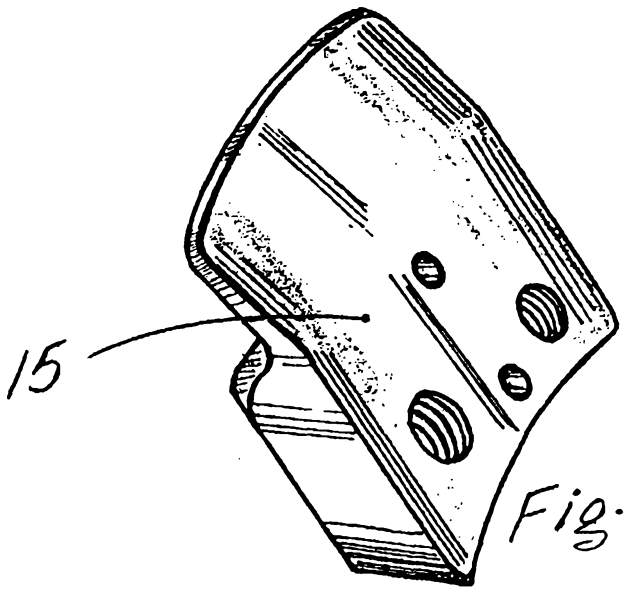


Fig. 16

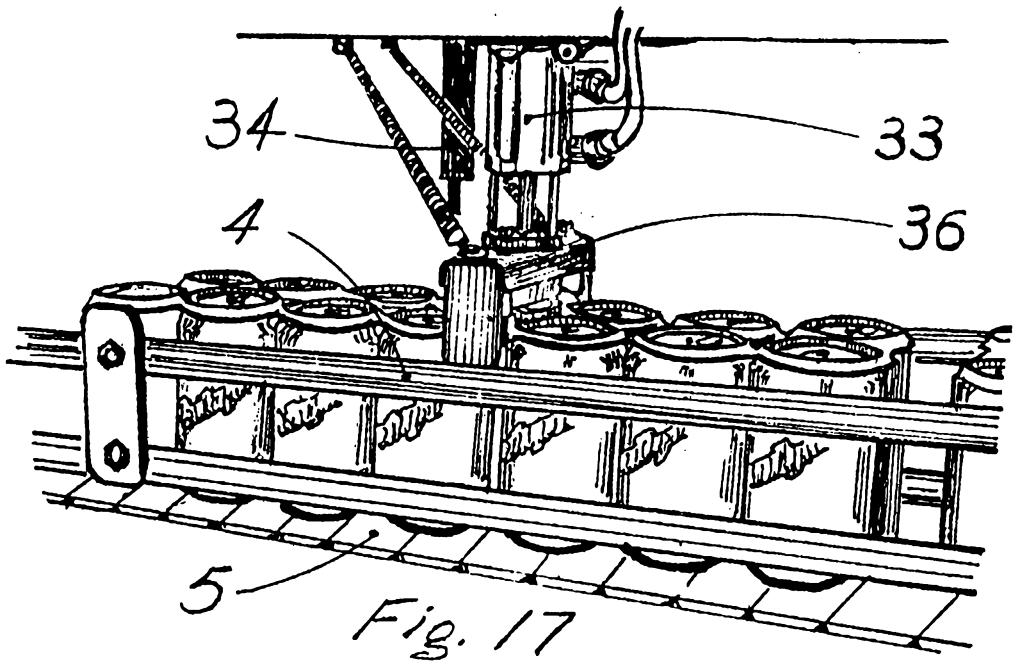


Fig. 17