Nov. 16, 1971 W. C. KERKER 3,619,976

BAG BUNDLING MACHINE

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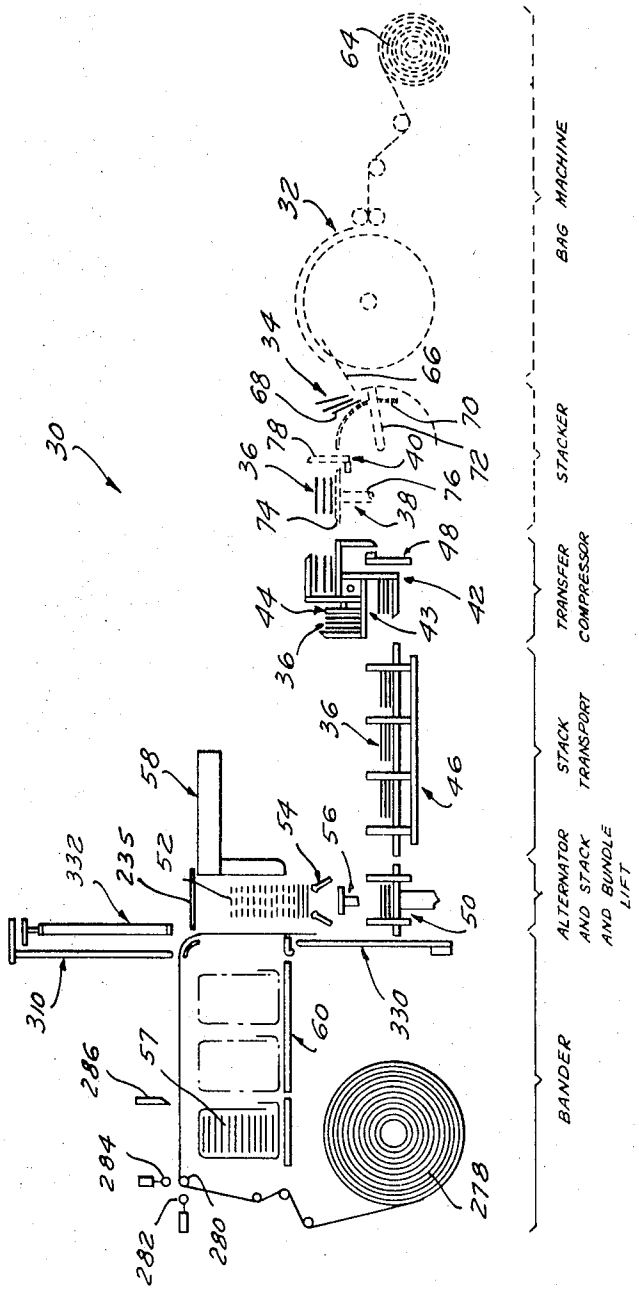

FIG. 1

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Nov. 16, 1971 W. C. KERKER 3,619,976

BAG BUNDLING MACHINE

Filed Jan. 27, 1970 19 Sheets-Sheet 2

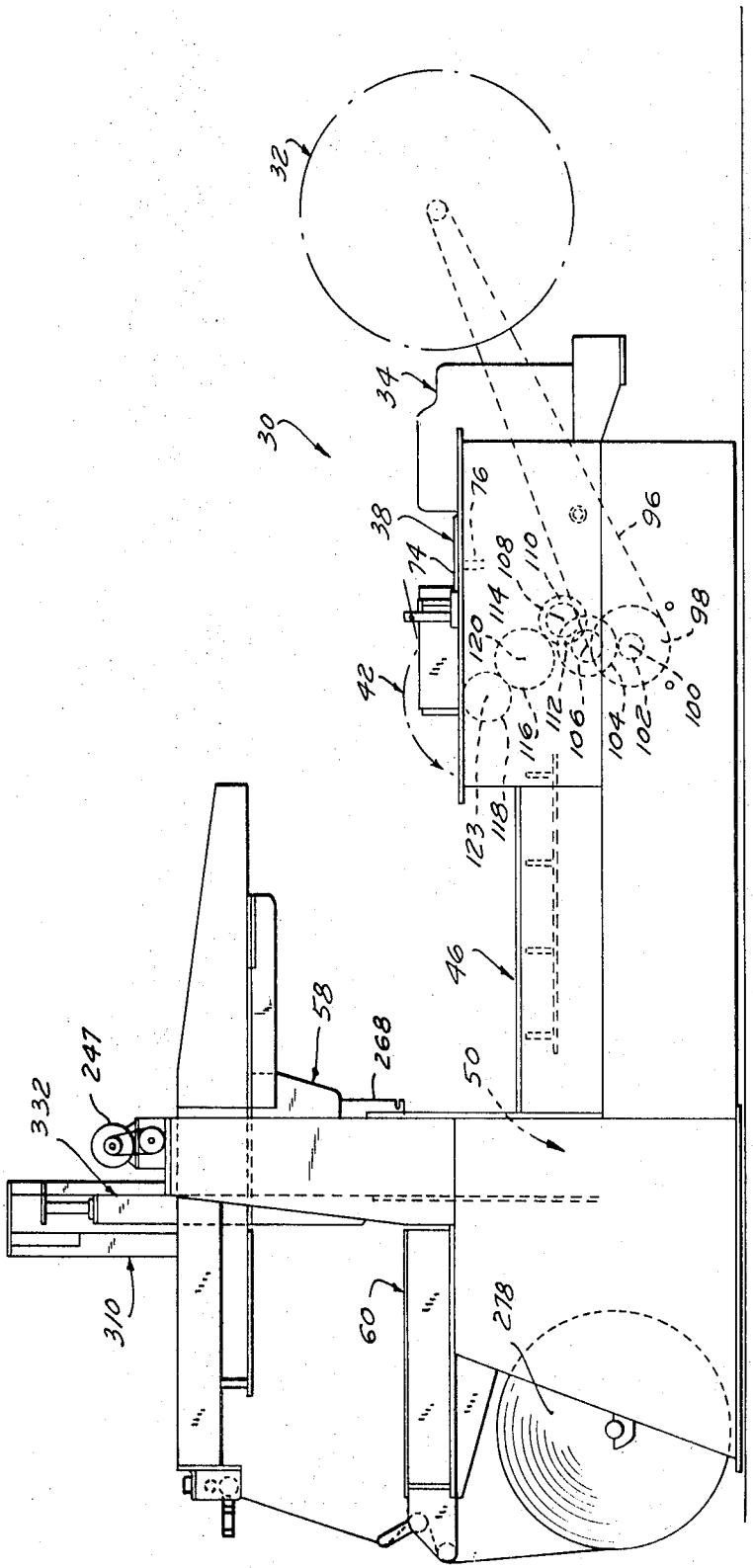

FIG. 2

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BAG BUNDLING MACHINE

Filed Jan. 27, 1970 19 Sheets-Sheet 3

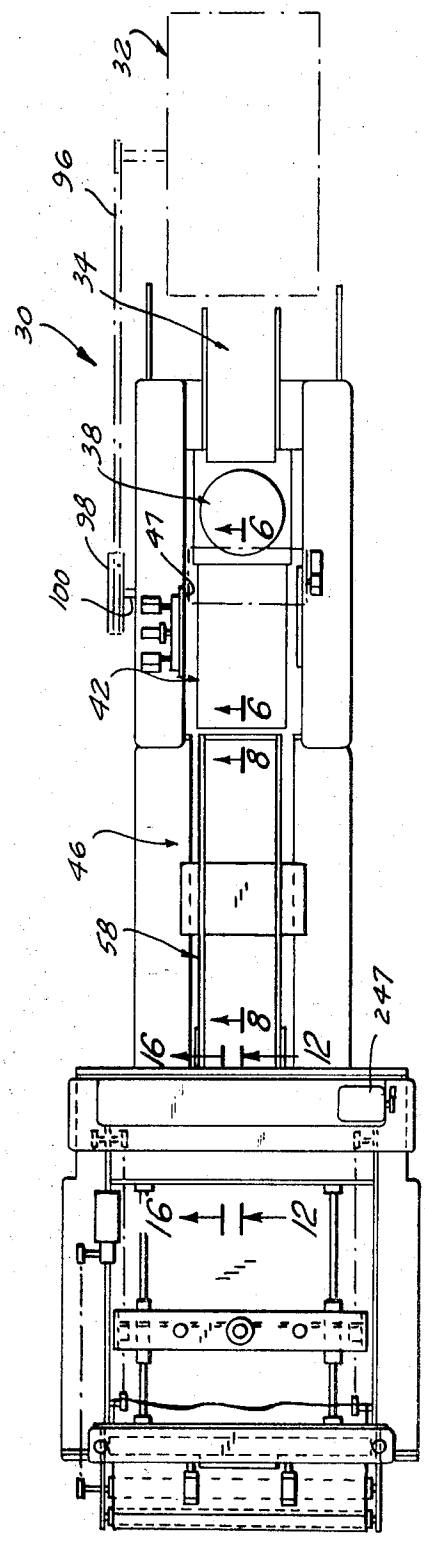

FIG. 3

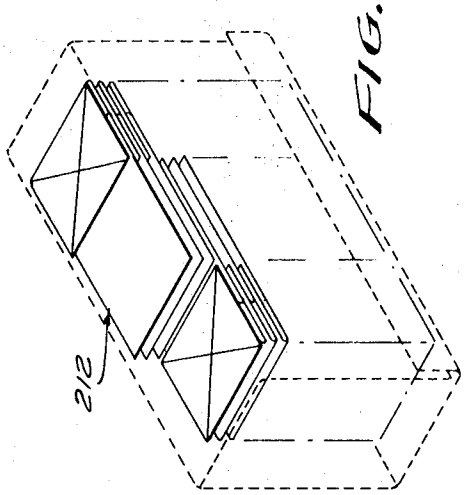

FIG. 5

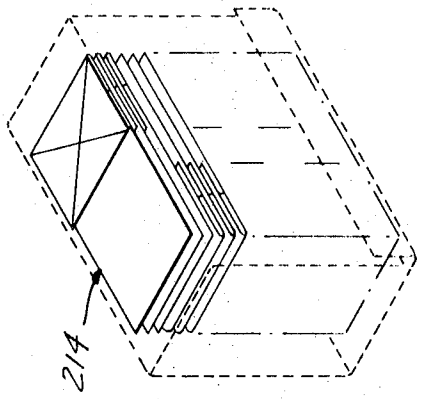

FIG. 4

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BAG BUNDLING MACHINE

Filed Jan. 27, 1970 19 Sheets-Sheet 4

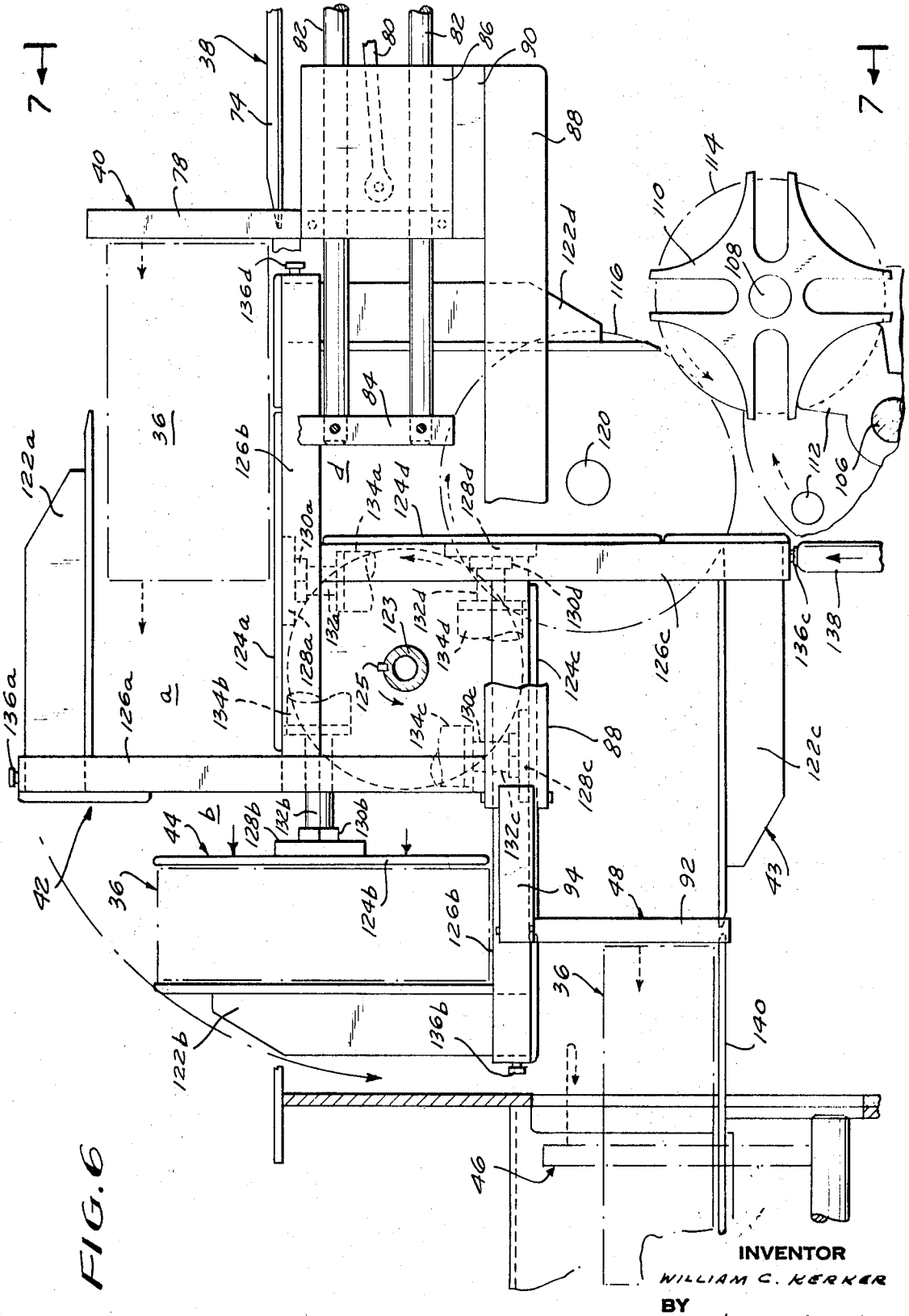

FIG. 6

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BAG BUNDLING MACHINE

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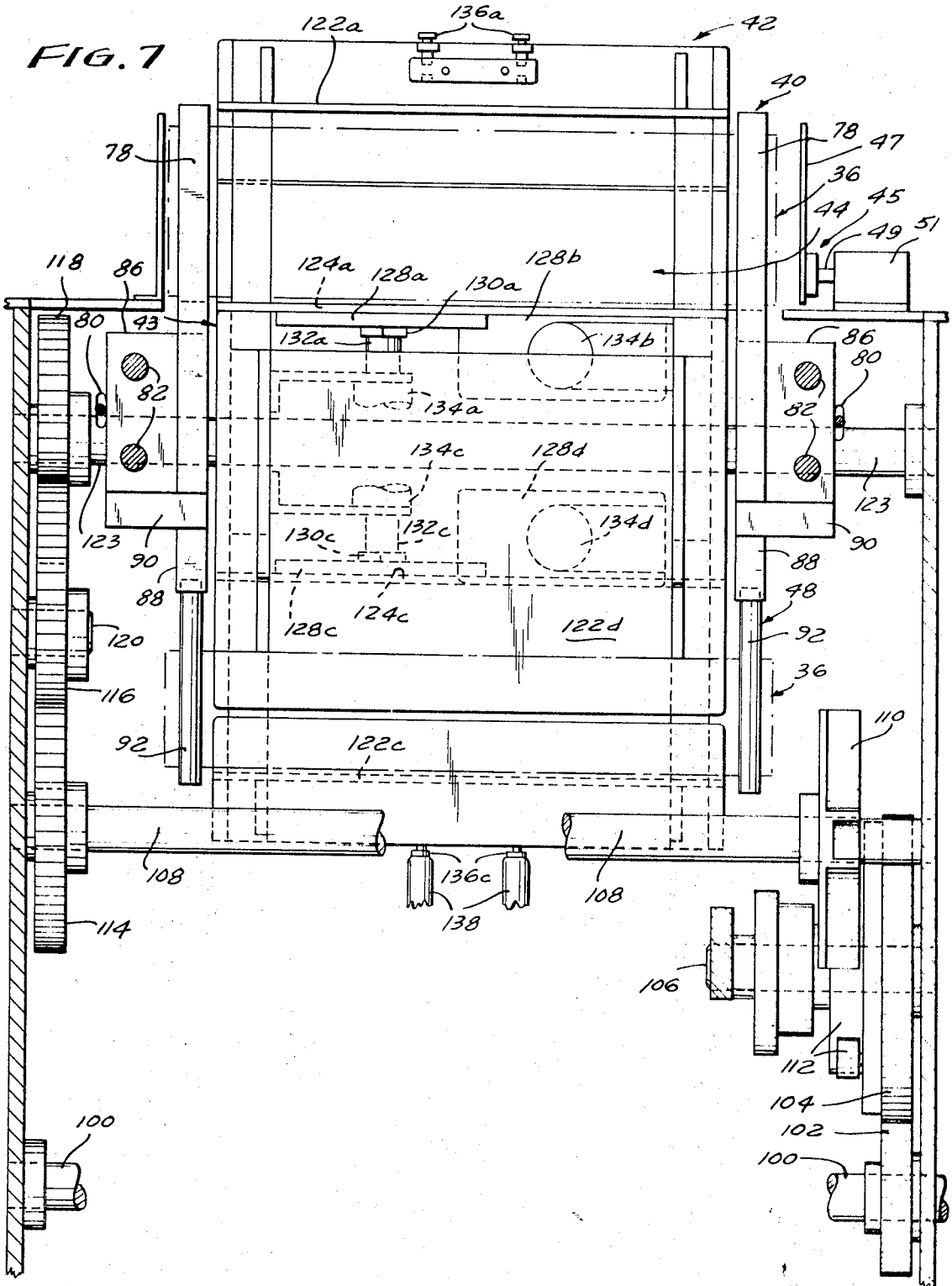
FIG. 7



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BAG BUNDLING MACHINE

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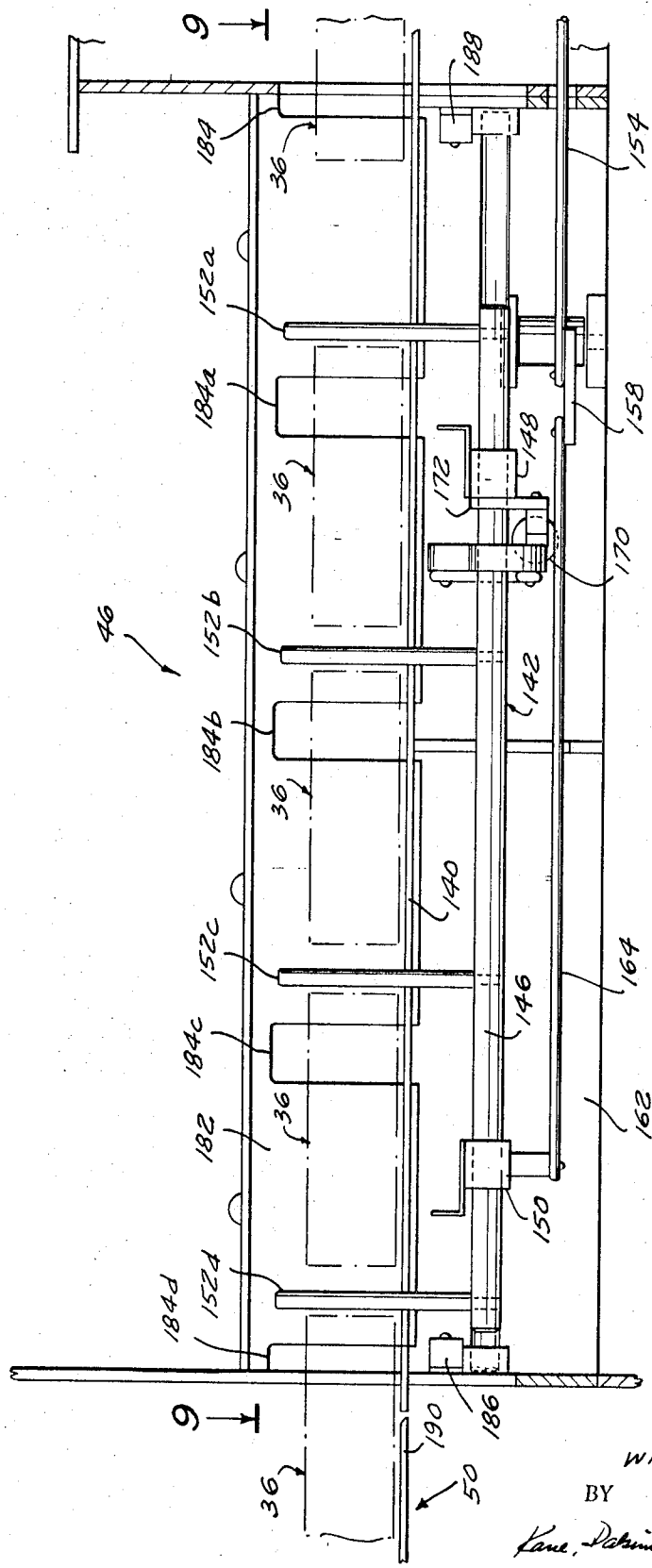

FIG. 8

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Nov. 16, 1971 W. C. KERKER 3,619,976

BAG BUNDLING MACHINE

Filed Jan. 27, 1970 19 Sheets-Sheet 7

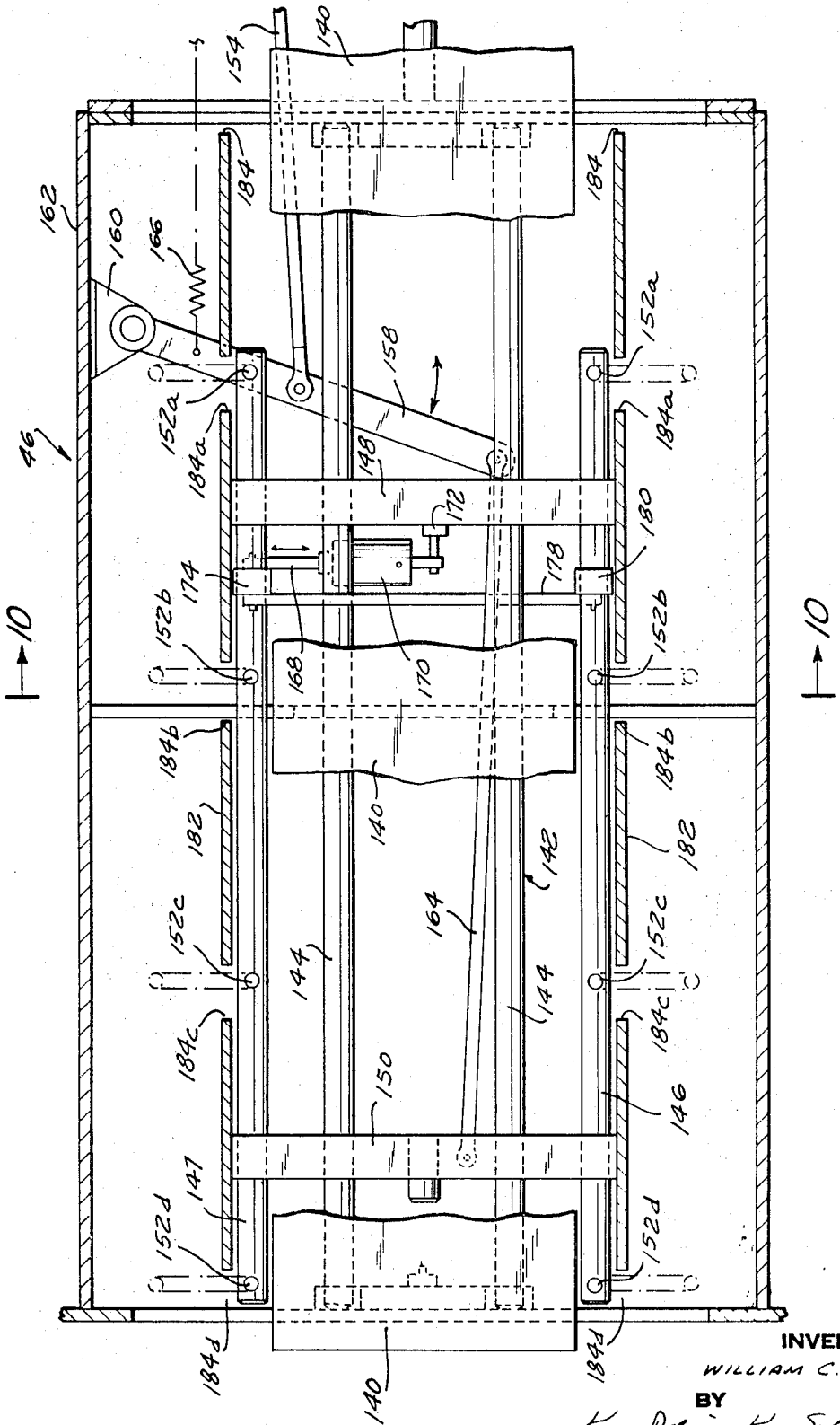

FIG. 9

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Nov. 16, 1971 W. C. KERKER 3,619,976

BAG BUNDLING MACHINE

Filed Jan. 27, 1970 19 Sheets-Sheet 8

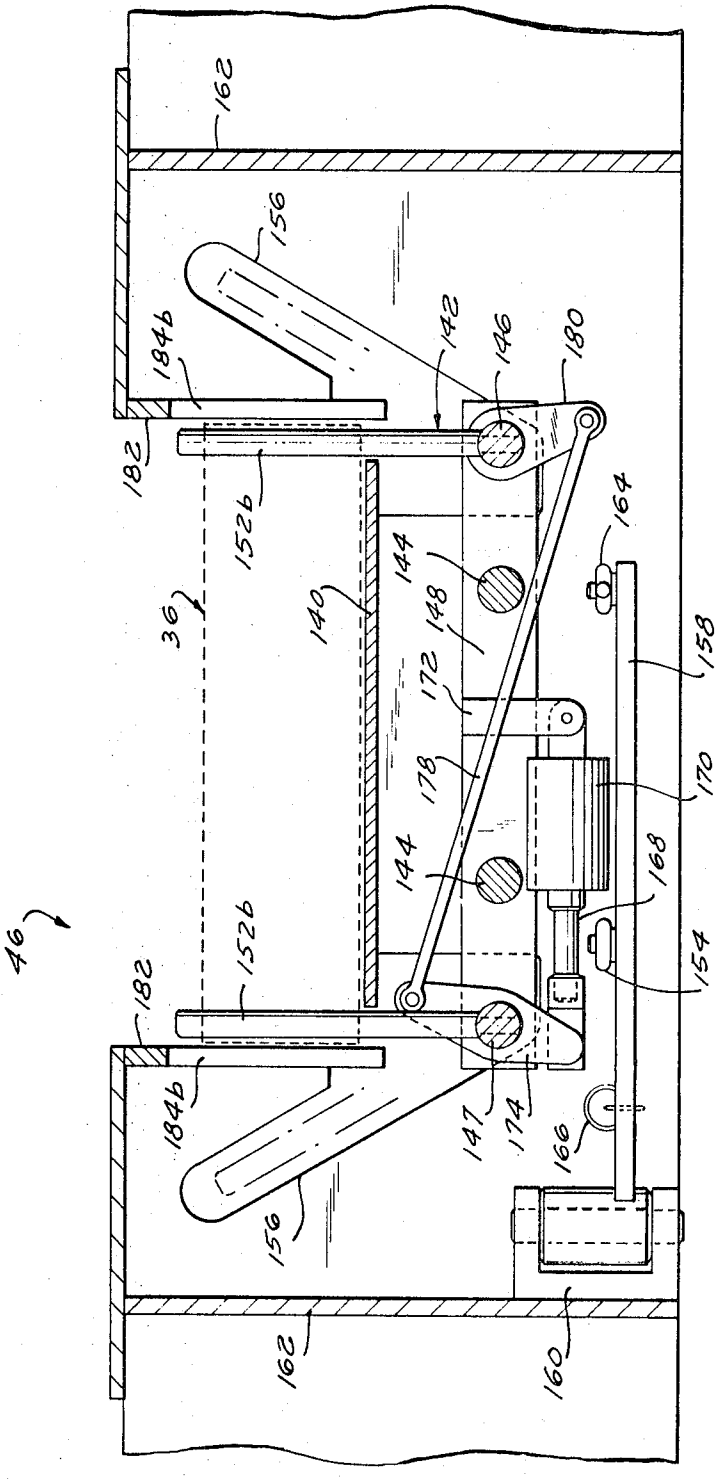

FIG. 10

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Nov. 16, 1971 W. C. KERKER 3,619,976

BAG BUNDLING MACHINE

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FIG. 11a

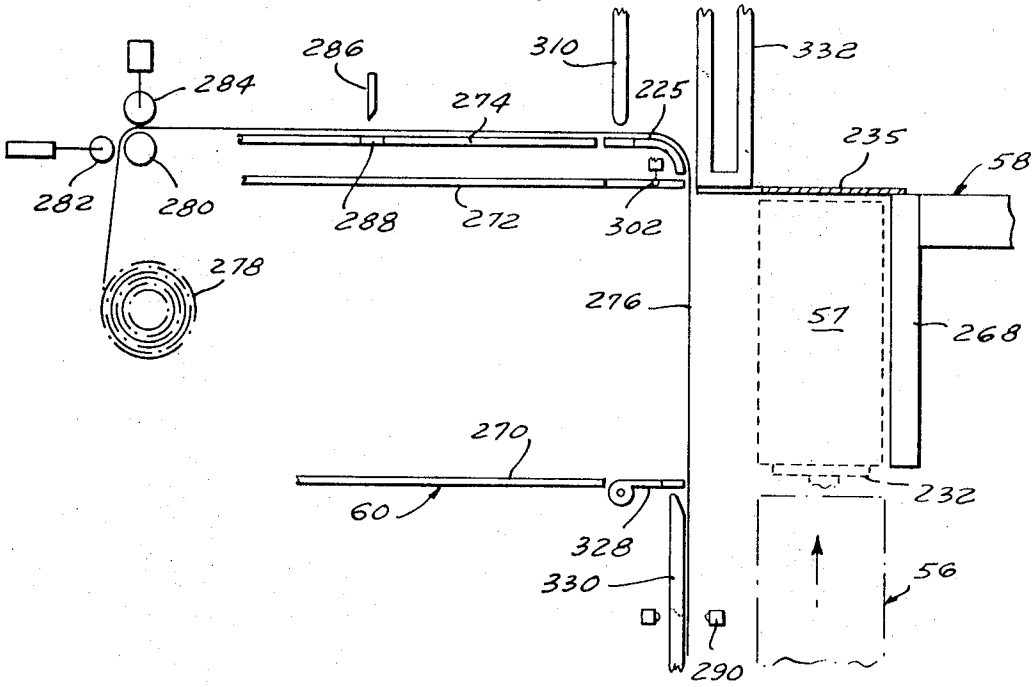


FIG. 11b

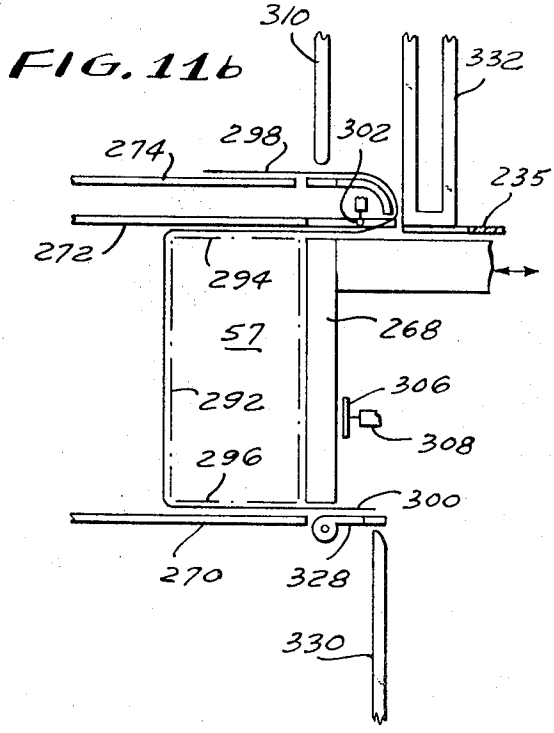
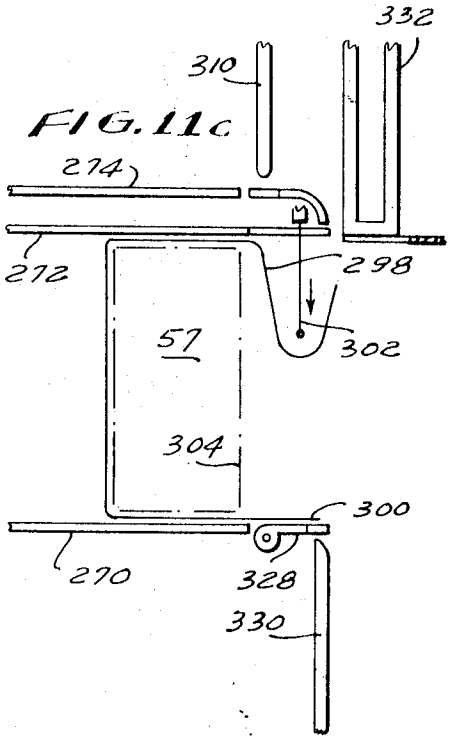


FIG. 11c



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BAG BUNDLING MACHINE

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FIG. 11d

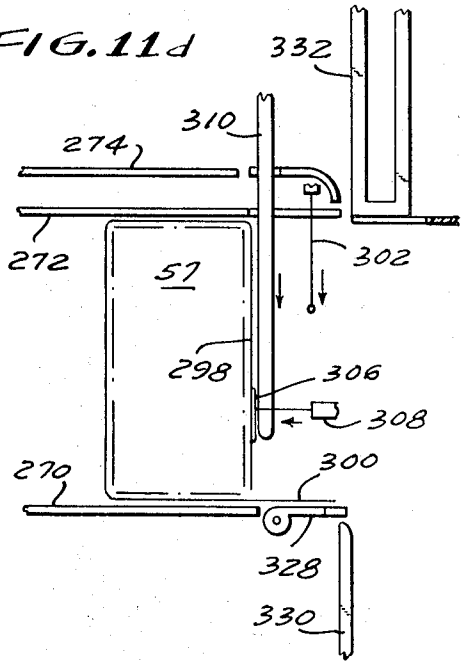


FIG. 11e

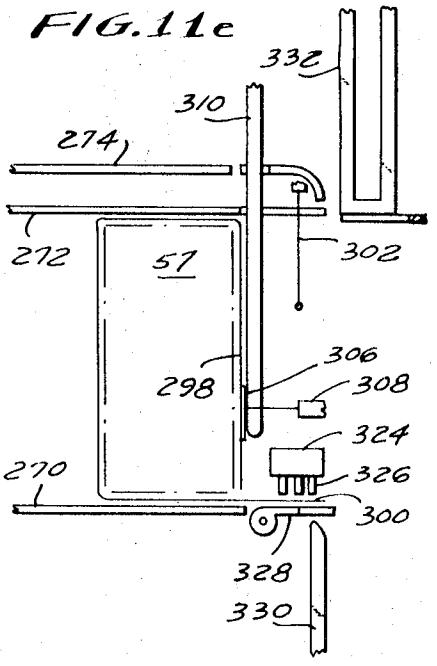


FIG. 11f

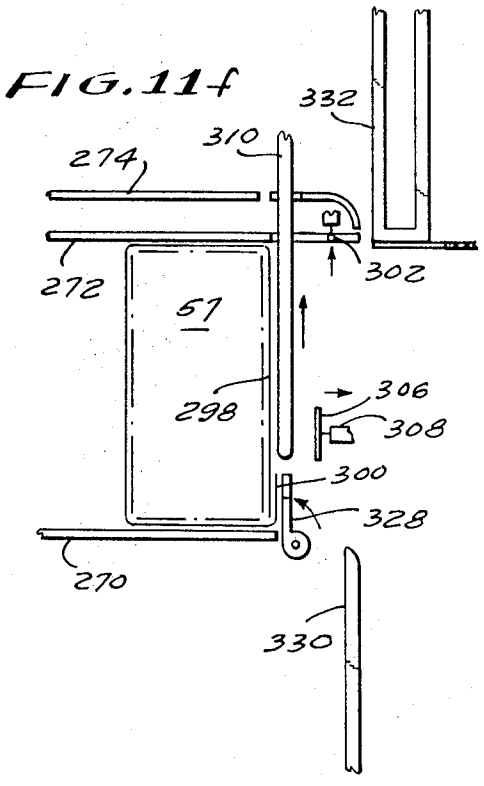
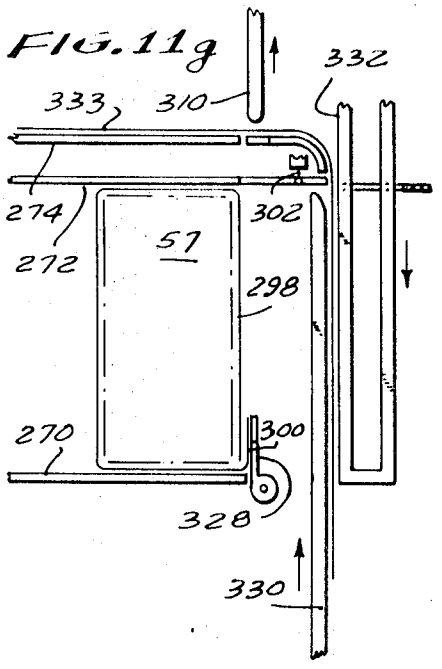


FIG. 11g



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Nov. 16, 1971 W. C. KERKER 3,619,976

BAG BUNDLING MACHINE

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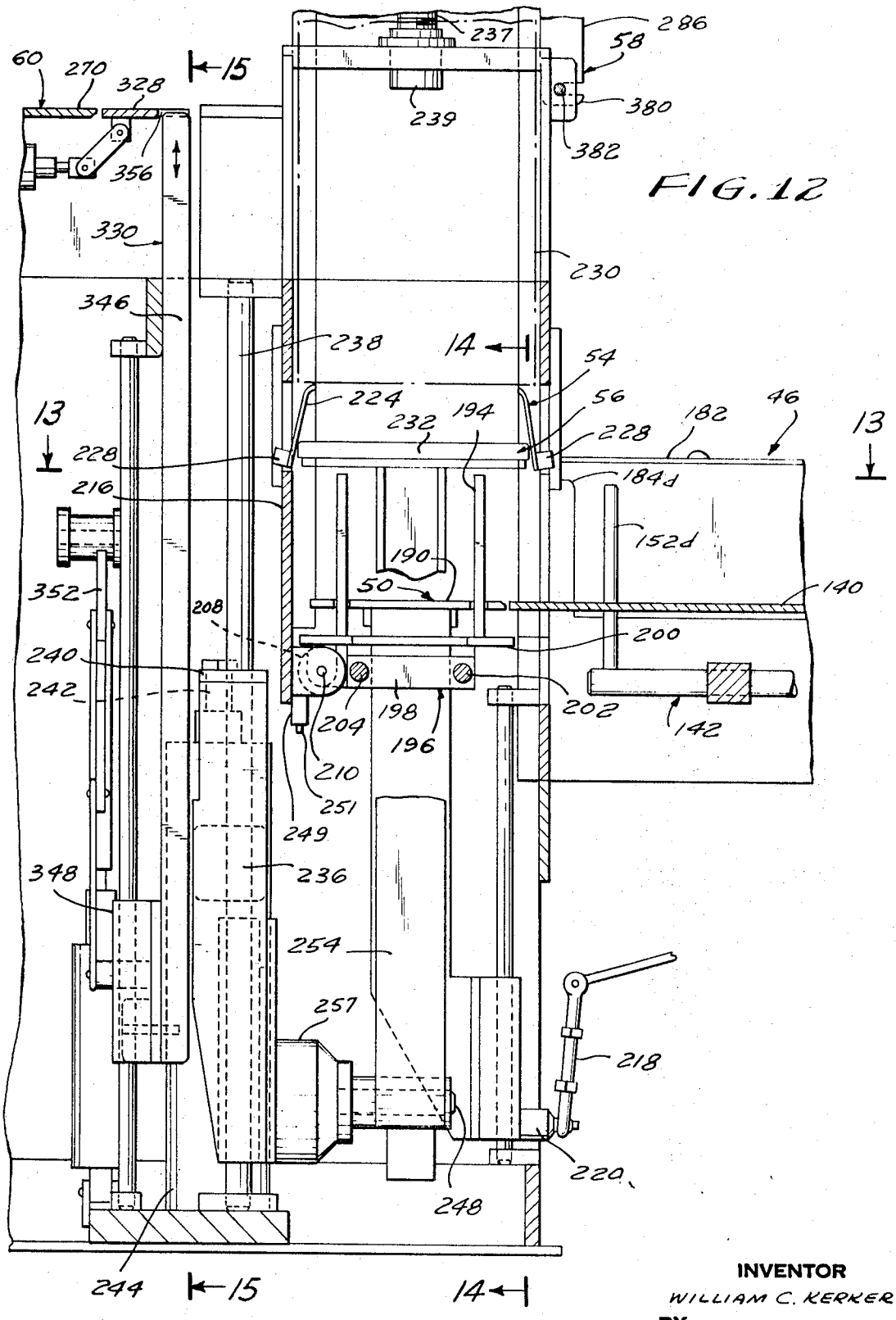

FIG. 12

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BAG BUNDLING MACHINE

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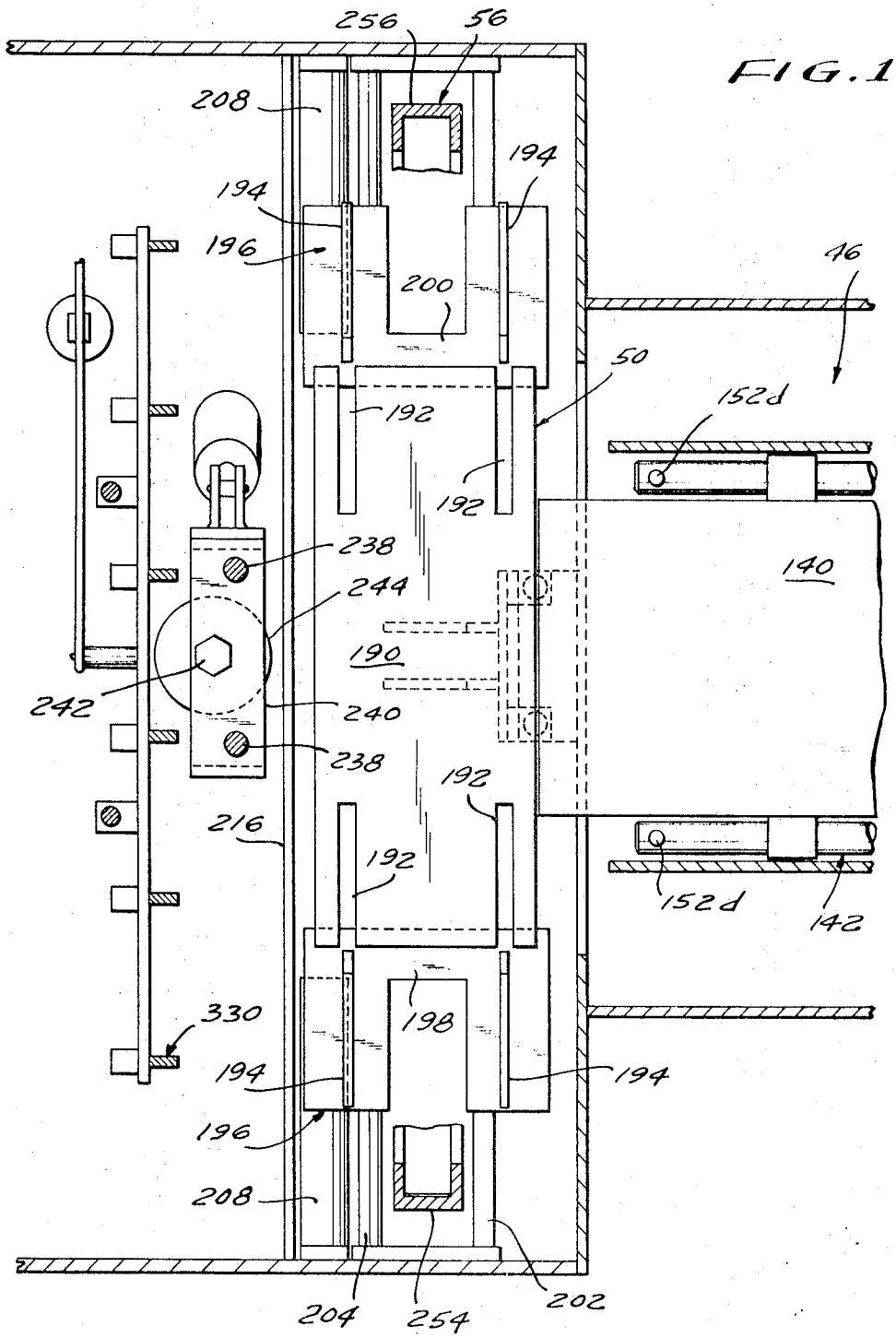
FIG. 13



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BAG BUNDLING MACHINE

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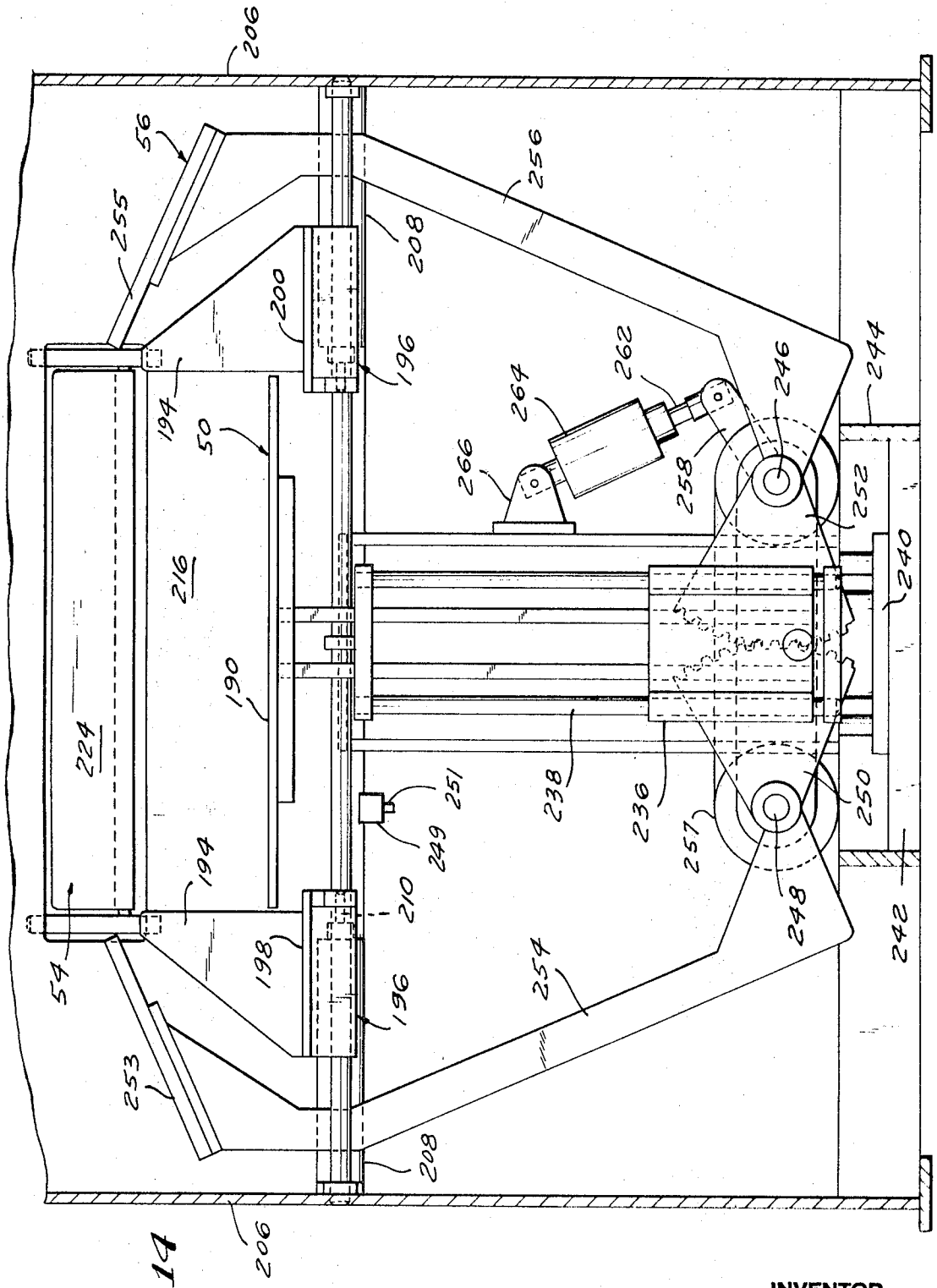

FIG. 14

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BAG BUNDLING MACHINE

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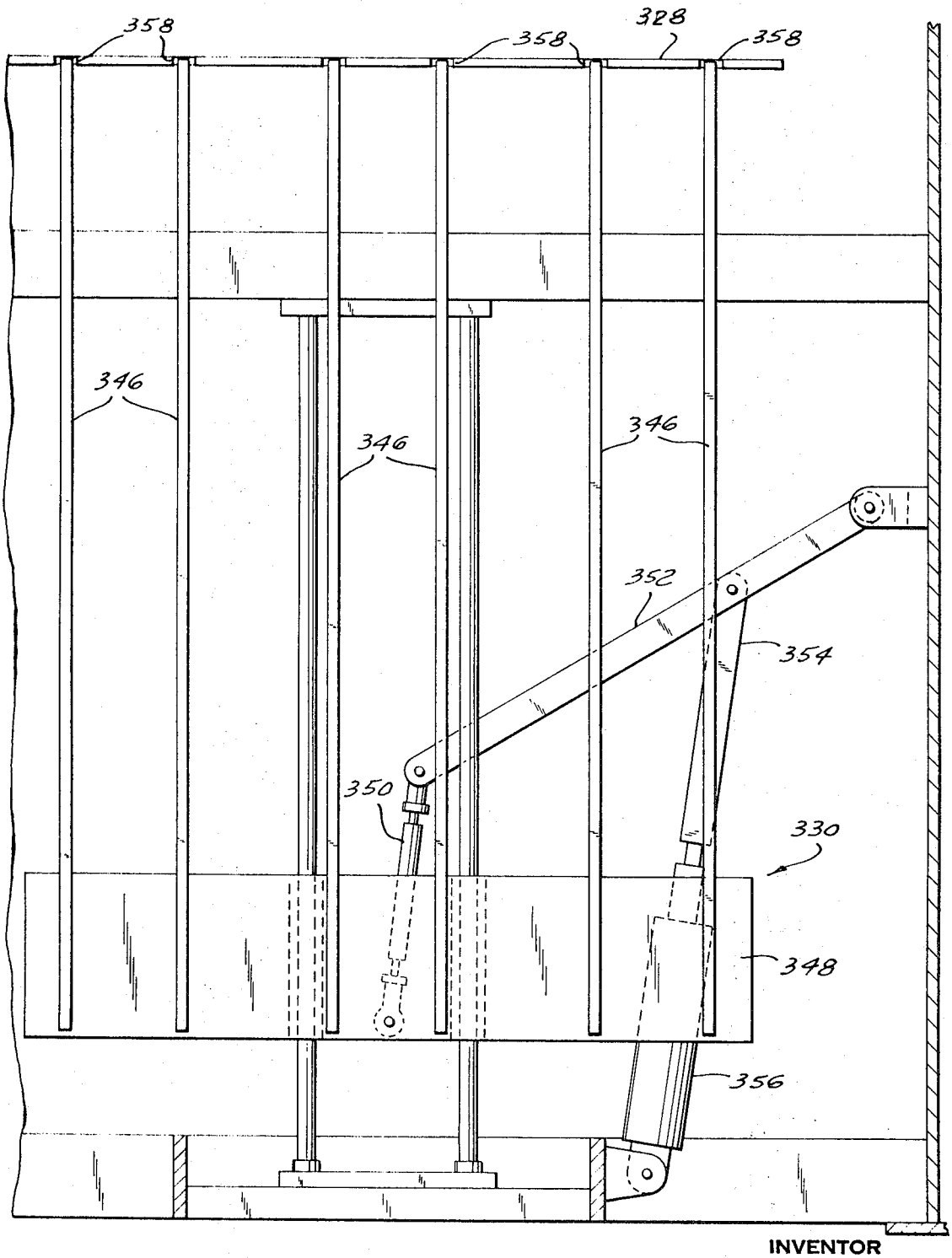
FIG. 15



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Nov. 16, 1971 W. C. KERKER 3,619,976

BAG BUNDLING MACHINE

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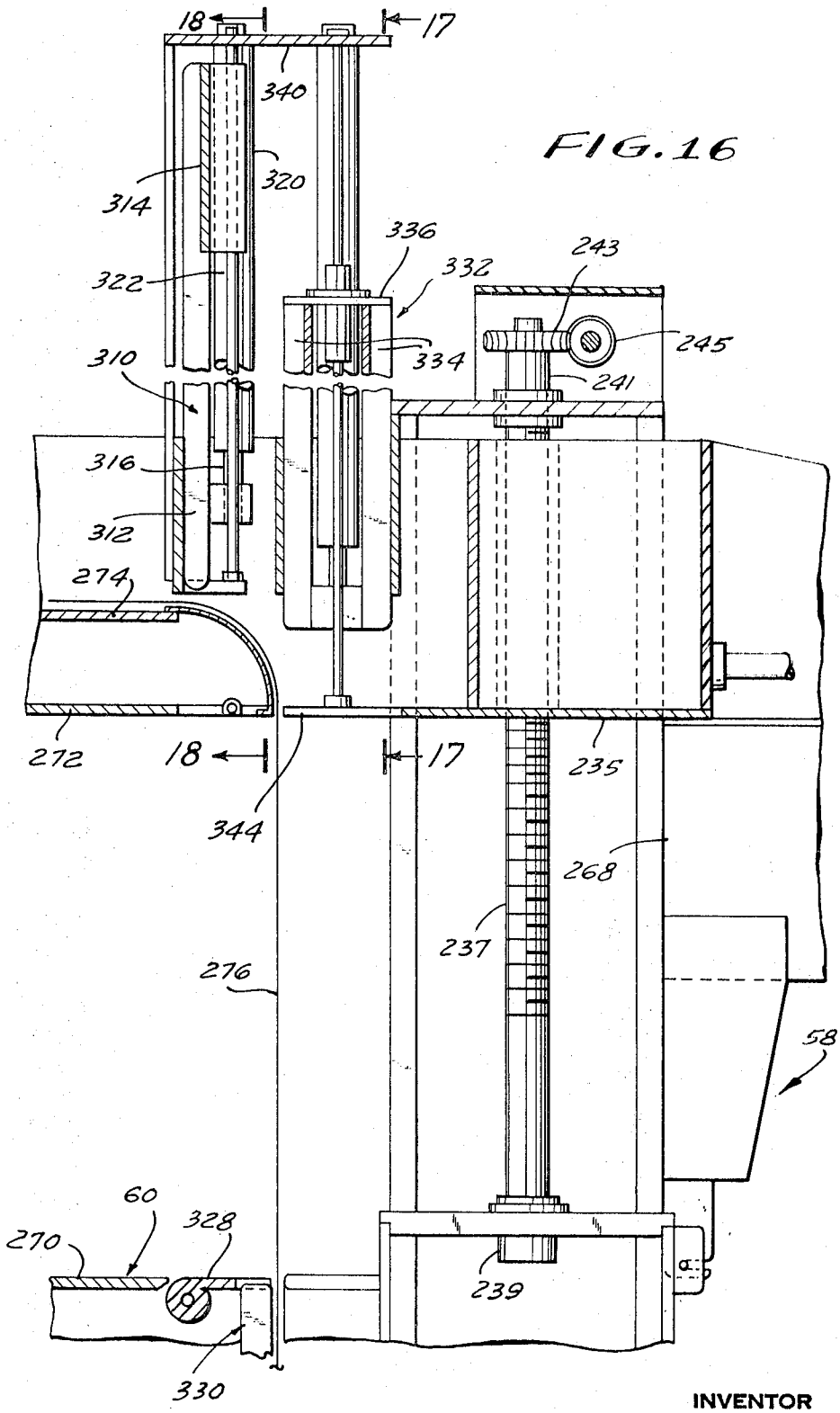
FIG. 16



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BAG BUNDLING MACHINE

Filed Jan. 27, 1970 19 Sheets-Sheet 16

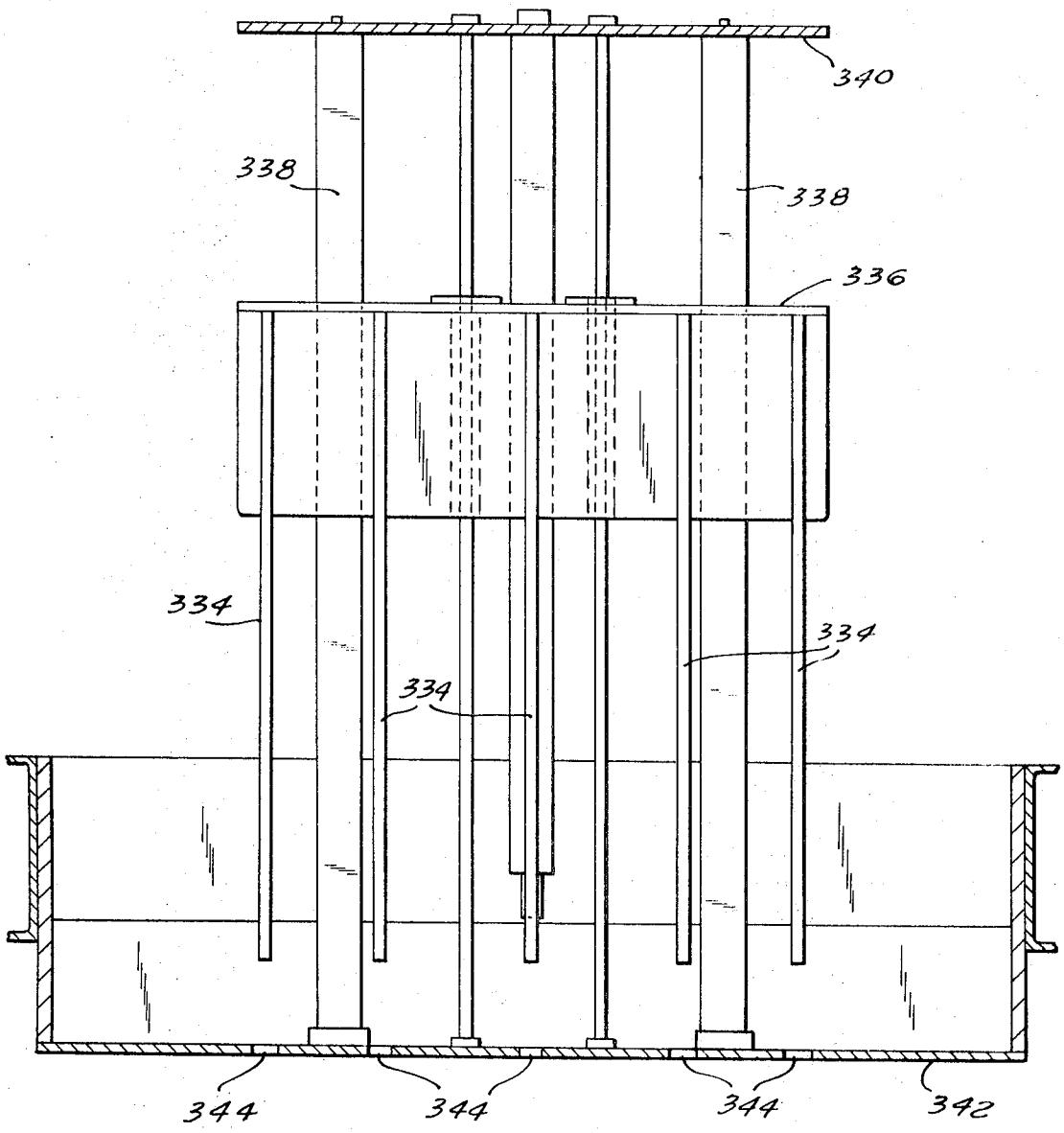

FIG. 17

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BAG BUNDLING MACHINE

Filed Jan. 27, 1970 19 Sheets-Sheet 17

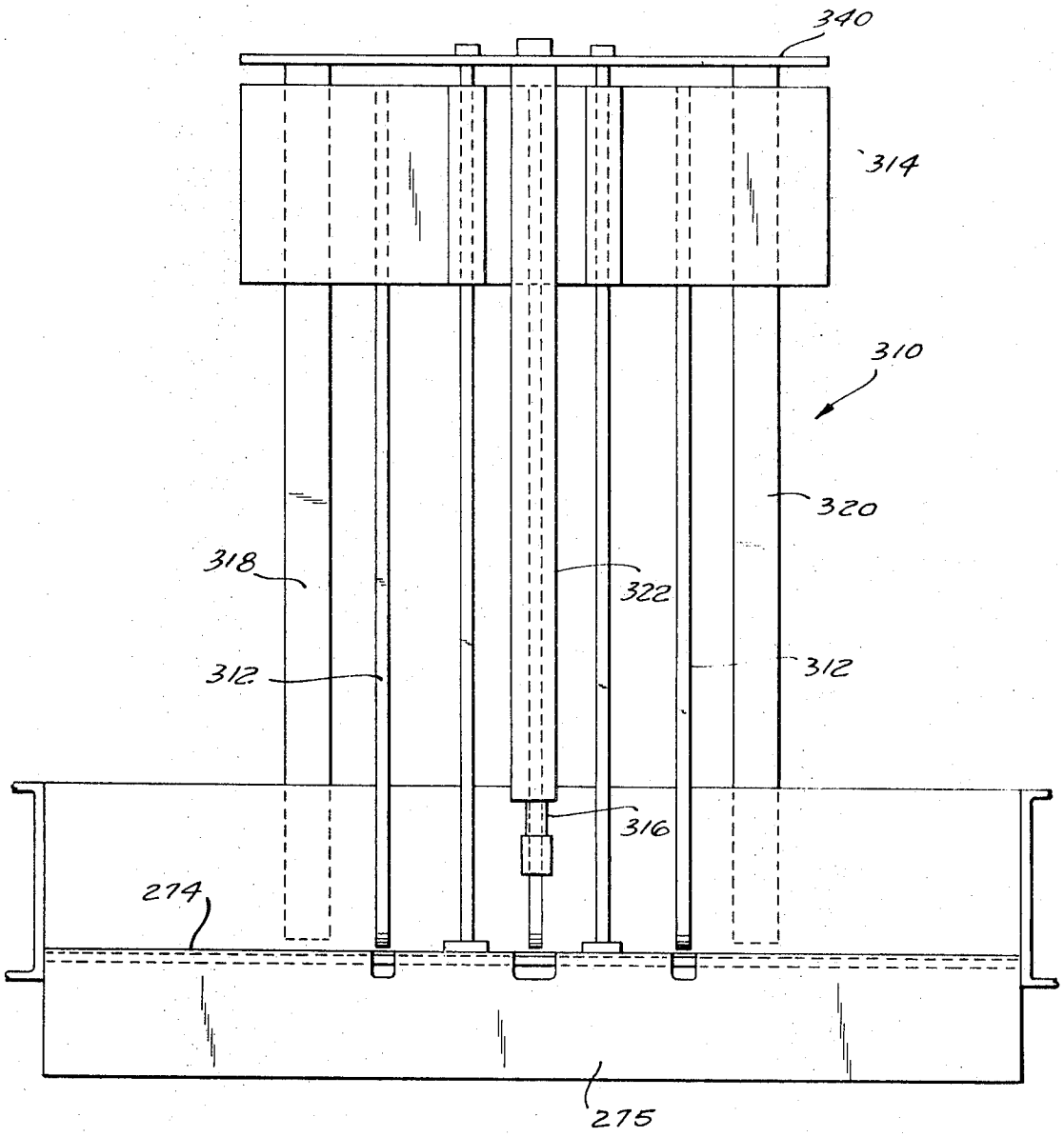

FIG. 18

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BAG BUNDLING MACHINE

Filed Jan. 27, 1970 19 Sheets-Sheet 18

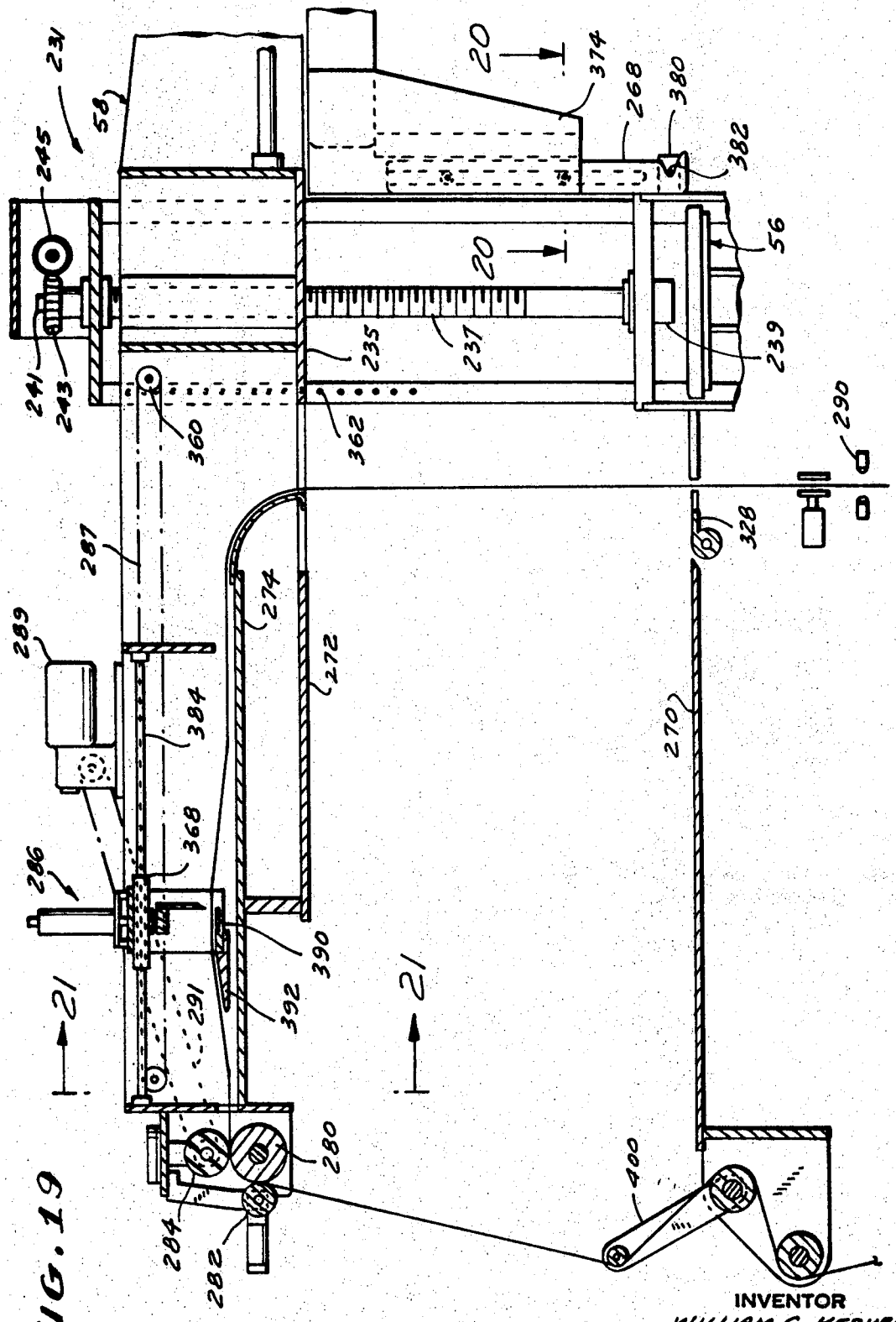

FIG. 19

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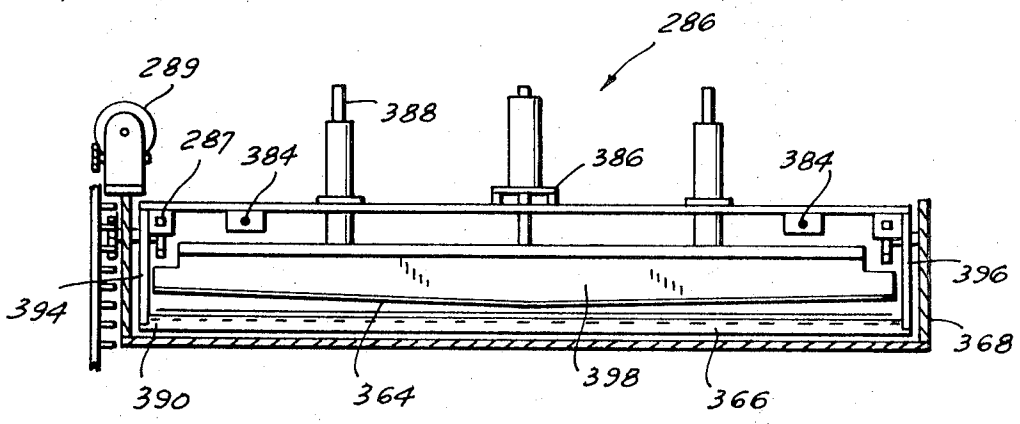
BAG BUNDLING MACHINE

Filed Jan. 27, 1970 19 Sheets-Sheet 19

FIG. 21



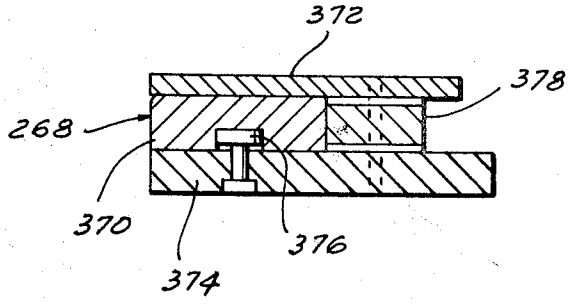


FIG. 20

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United States Patent Office 3,619,976 Patented Nov. 16, 1971

3,619,976

BAG BUNDLING MACHINE

William C. Kerker, deceased, late of Rye, N.Y., by Potdevin Machine Co., 200 North St., Teterboro, N.Y. 07608

Continuation-in-part of application Ser. No. 718,292, Feb. 19, 1968. This application Jan. 27, 1970, Ser. No. 6,188
(Filed under Rule 47(b) and 35 U.S.C. 118)
Int. Cl. B65h *13/20*
U.S. Cl. 53—124 C 24 Claims

ABSTRACT OF THE DISCLOSURE

A paper bag bundling machine is provided which is adapted to remove individual bags produced by a bag-making machine, stack the bags and compress the stacks with the bag bottoms facing upwardly and thereafter to convey the stacks to a station at which the stacks are superimposed one upon the other to form a bundle of either standard configuration or long-pack configuration which bundle is further compressed and then banded to retain the compressed condition.

BACKGROUND OF THE INVENTION

Paper products and particularly bags and envelopes are generally consumed in relatively large numbers and consequently must be supplied to vendors in considerable quantities. Naturally, products of this type are considered bulky and when packaged in bundles both for shipment and storage, an unusually excessive amount of space is taken up, notwithstanding the relative lightness of weight of the bundles. With this in mind, there has been a great demand and need for bundling apparatus and techniques for packing paper bags which are capable of producing a compact and compressed bundle that will occupy only a minimum amount of space. Several attempts have been made to construct, develop and distribute bundling machines of this type. These machines, however have failed or have been ineffective for one reason or another.

CROSS-REFERENCES TO RELATED APPLICATIONS

In the application for United States Letters Patent Ser. No. 718,292, filed on Feb. 19, 1968 of which the present application constitutes a continuation-in-part, a bundling machine is disclosed which is satisfactory for many purposes. As will be appreciated by those skilled in the art, it would be desirable to have the machine offer further advantages such as the ability to produce both long-pack bundles and standard pack bundles.

SUMMARY OF THE INVENTION

It is, therefore, a principal object of this invention to provide a bag bundling machine which may be coupled to the discharge end of a bag-making machine, and which will satisfy the needs and demands of the trade and one which is capable of efficiently bundling in compressed condition a predetermined number of paper bags either in standard or long pack bundles.

Another object of this invention is to provide a bag bundling machine of this type in which improved mechanisms are incorporated for removing and stacking the individual bags produced by the bag-making machine; for rotating alternate stacks in opposite directions to alternate the location of the bag bottoms in relation to the bag tops; for transferring the alternate stacks to a transporter and while the stacks are being transferred for compressing the stacks to remove most of the entrapped air therein and to invert each stack so that the bottom of each bag faces upward for easy inspection of the bottom and the printed side of the bag; for transporting the alternately arranged stacks to a bundler; for lifting the stacks to an elevated position; for compressing the stacks to a prescribed volume following the accumulation of a predetermined number of stacks arranged in either regular or long-pack bundles; and for applying a wrapping band to the compressed bundle.

These and other objects and advantages are effectively attained by the improved bag-bundling machine of this invention which is adapted to be coupled directly to the discharge end of a paper bag-making machine. After individual bags are completed and transferred to the discharge station of the bag-making machine, they are picked off and stacked. When a prescribed number of bags have been accumulated in the stack, the stack is transferred onto a turntable which is adapted to rotate and thereby orient one stack in one direction and the subsequent stack in a reverse direction and to repeat this process so that the bottom ends of the bags of alternate stacks are opposed to the open top ends of the adjacent stacks. In this manner, when the stacks are subsequently bundled, a more uniformly dimensioned bundle is obtained. The stacks are then pushed into a transfer compressor which simultaneously compresses the individual stacks to remove most of the entrapped air therefrom and also inverts them so that the bag bottom and printed side face upward. The compressed stacks are then transferred to a transporter which conveys or transports the stacks to a first elevator where the individual stacks are lifted to an accumulating station. When a predetermined number of stacks have been accumulated at the station, they are lifted as a bundle by a second elevator and thereafter compressed so that the bundle occupies a reduced volume. The individual stacks at the accumulating station may be arranged one directly on top of the other so as to form a standard pack (called in the trade a "short pack") or the alternate stacks may be longitudinally shifted off center a distance such that the lower end of one stack overhangs the top end of the stack directly beneath and above it, thereby forming a "long pack." This arrangement permits the formation of a more uniformly dimensioned bundle. The compressed bundle is then pushed to a banding station at which a band of material is wrapped around the compressed bundle and secured in a manner to assure the retention of the compressed condition of the bundle.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is an overall schematic view of the paper-bag bundling machine of the present invention shown associated with a paper-bag making machine at its leading end and a bundle-banding machine:

FIG. 2 is a side elevational view of the paper-bag bundling machine of the present invention, only the last stage of the paper-making machine is depicted for clarity, the transfer compressor drive is depicted in phantom;

FIG. 3 is a top plan view of the bag-bundling machine;

FIG. 4 is a perspective view of a short-pack bundle of bags formed with the machine of the present invention, the bundle-band is depicted in phantom;

FIG. 5 is a view similar to FIG. 4 depicting a long-pack bundle configuration;

FIG. 6 is a fragmentary elevational sectional view taken along reference line 6—6 of FIG. 3 and depicting the turret drive system of the transfer compressor of a successful embodiment of the invention;

FIG. 7 is a sectional view taken along reference line 7—7 of FIG. 6;

FIG. 8 is a fragmentary elevational sectional view and forms a continuation of FIG. 6 through the stacker;

FIG. 9 is a sectional view taken along reference line

9—9 of FIG. 8 depicting the stack transport carriage assembly of the present invention;

FIG. 10 is a fragmentary sectional view taken along reference line **10—10** of FIG. 9 and depicts the stack transport pusher arms in an engaging position;

FIGS. 11*a* through 11*g* are fragmentary side views illustrating the sequence of steps involved in banding a bundle of stacks in accordance with one successful application of this invention;

FIG. 12 is an enlarged fragmentary elevational view of the trailing end of the stack transport, stack-lifter, bundle-lifter and the leading edge of the bundle bander;

FIG. 13 is a sectional plan view taken along reference line **13—13** of FIG. 12 and depicts the mechanism which permits the present invention to form either 'long pack" or regular pack bag bundles;

FIG. 14 is an enlarged elevational view taken along reference line **14—14** of FIG. 12 and generally depicts the drive system of the bundle lifter;

FIG. 15 is an elevational sectional view taken along reference line **15—15** of FIG. 12 and depicts the bottom sheet guide of the bundling station of the present invention and the folding plate in the down position;

FIG. 16 is an enlarged elevational view of the bundle pusher which transfers the bundles to the wrapping station, the wrapping band supply and the bundler of the present invention;

FIG. 17 is a sectional view taken along reference line **17—17** of FIG. 16 depicting the upper sheet guide of the bundling station and depicts the upper sheet guide of the banding station;

FIG. 18 is a sectional view taken along reference line **18—18** of FIG. 16;

FIG. 19 is a diagrammatic view of the movable bundle compressor mechanism of the present invention;

FIG. 20 is a sectional view taken along reference line **20—20** of FIG. 19; and,

FIG. 21 is an enlarged side elevational sectional view of the knife mechanism which severs the bundling material from the feed roll taken along lines **21—21** of FIG. 19.

DESCRIPTION OF THE PREFERRED EMBODIMENT

General description

In the drawings, a paper-bag bundling machine **30** is coupled with a paper-bag making machine **32** and is provided with a stacker **34** which operates to remove and stack the bags as they are produced by the bag-making machine **32**. When a predetermined number of bags are stacked, a lifting mechanism of the stacker **34** lifts and transfers the stack **36** on to a turntable **38**. The turntable **38** is adapted to orient alternate stacks such that the bottom ends of one stack of bags are opposite the open top ends of the bags of the adjacent stacks. A pusher mechanism **40** pushes the properly oriented stacks **36** on to a transfer compressor **42** which includes a turret assembly adapted to invert the stack **36** so that the bottom of each bag of the stack faces upward. This procedure permits the inspection of the bags as they proceed along the bundling machine without requiring a slowdown in the production line.

The transfer compressor **42** includes a turret assembly **43** and is provided with a compressing mechanism **44** which serves to compress the stacks and thereby remove most of the entrapped air. The compressed stacks **36** are then pushed onto a stack transporter **46** by pusher mechanism **48'** which is coupled to pusher mechanism **40** and synchronized with the rotation of the turret assembly **43** of the transfer compressor. At the discharge end of the stack transport **46**, the stacks **36** are transferred onto the platform of the stack-lifting or elevator mechanism **50**. The stacks are elevated by the stack elevator **50** to an elevated stack-supporting mechanism **54** on which a predetermined number of stacks are accumulated to form a

bundle **52**. The stacks may be accumulated on the stack-supporting mechanism **54** one directly on top of the other or alternate stacks may be shifted toward opposite ends of the adjacent stacks so as to form a "long-pack" bundle which is one wherein the bottom ends of one stack extend over the open ends of the bags in the stacks on opposite sides of it.

Upon the accumulation of a predetermined number of stacks constituting a prescribed bundle, a bundle-lifting mechanism **56** lifts and compresses the accumulated stacks to a position where a bundle pusher mechanism **58** pushes the compressed bundle to a banding station **60**. At the banding station **60**, a band of outer wrap is applied about the compressed bundle **52** to retain the bundle in this condition.

In the copending application for United States Letters Patent Ser. No. 718,292, filed on Feb. 19, 1968, a bundling machine is disclosed which described in detail the operation of the bag-stacker and turntable mechanisms. Since this preferred embodiment of the present invention contemplates the use of several similar mechanisms, the present description of the similar mechanisms will be kept to a minimum for purposes of clarity and brevity and the drawings relating to these mechanisms will be simplified so as to eliminate all but the essential features.

PAPER BAG-MAKING MACHINE

The paper bag-making machine **32** may assume any one of a number of different forms well known to the art. For example, the paper bag-making machine **32** may be of the type disclosed in commonly assigned United States Pat. No. 3,172,342, granted on Mar. 9, 1965. This machine **32** is commercially available and operates to progressively transform a web **64** of sheet material such as paper into tubing having bellowed sides. The tubing is periodically notched, slit and then severed into predetermined lengths. The bottom of the bags are then formed so as to provide bags of a predetermined length.

BAG STACKER

The bag stacker **34** strips the individual bags as they are formed by the bag-making machine **32** and accumulates them in a stacked arrangement. In accordance with the commercial practice, the bags are arranged in stacks of twenty-five each. Toward this end, the bag stacker **34** includes a bag stripper **66** which could very well be taken to be part of the bag-making machine **32**. When the twenty-fifth bag has been stripped, the quantity of bags **68** of stack **36** accumulated on suitable portions of the stacker **34** is gripped and lifted onto the turntable **38** in a manner which is described in detail in the application for Letters Patent Ser. No. 718,292, filed on Feb. 19, 1968. For the present, it suffices to say that a quantity of twenty-five bags **68** is accumulated on the surface of the arcuate plate **70** and thereafter lifted by arm **72** to the turntable **38**. The movement of the parts of the stacker **34** are synchronized with the operation of the bag-making machine **32**. In this regard, the drive of the stacker **34** may be taken directly from the bag-making machine **32** by means of a chain and sprocket wheeldrive. This operation is also discussed in detail in the co-pending patent application which has already been referred to.

TURNTABLE

The quantity of bags **68** lifted onto turntable **38** forms a stack **36**. As the stacks **36** of bags are lifted onto the platform **74** of the turntable **38**, the alternate stacks are turned 90° in one direction and then 90° in the other so that the orientation of alternate stacks is 180° out of phase with respect to each other. The platform **74** is mounted on a suitably journaled shaft **76**. Thus shaft **76** will be turned 90° one way and then 90° the other way for each succeeding cycle by the operation of a crank mechanism which is described in detail in the co-pending application previ-

ously referred to. The drive of the shaft is also synchronized with that of the bag-making machine.

PUSHER MECHANISM

The properly oriented stack **36** on platform **74** of turntable **38** is then adapted to be shifted onto the transfer compressor **42** by pusher **40** which is shown in FIG. 6. The pusher mechanism **40** includes a pusher arm **78** which is suitably linked through link **80** in such a manner that when the pusher **40** is actuated to shift the stack **36** onto the transfer compressor **42**, the pusher will remain in an upright position throughout the entire cycle of movement. This may be accomplished by having pusher **40** forming part of a block that travels on rails **82** which in turn are fixed to the machine frame portion **84**. The operation of the pusher assembly device and its synchronization with the bag stacker and turntable are described in detail in the co-pending application. Pusher arm **78** is connected to plate **86** which rides on rails **82**. Plate **86** is also coupled to connecting arm **88** through member **90** and connecting arm **88** is adapted to shift along a path parallel to rails **82** as pusher arm **78** shifts. A second pusher arm **92** similarly is affixed to the far end of connecting arm **88** through plate **94**, so that both pusher arms **78** and **92** will move forward and retract in unison thereby serving to simultaneously push one stack of bags into one section of the transfer compressor and push another stack off the compressor. As seen in FIG. 7, the location of pusher arms **78** and **92** with respect to the transfer compressor is such as to not hinder the free rotation of the transfer compressor turret. Where desired, a pair of identical pusher mechanisms **40** may be provided on opposite sides of the machine as shown in FIG. 7.

TRANSFER COMPRESSOR

The transfer compressor assembly **42** receives the stack **36** that is pushed off turntable **38** by pusher arm **78**, compresses the stack to remove most of the entrapped air and to thereby reduce the volume of the stack of bags, and then transfers the stack to the stack transport **46**.

The transfer compressor assembly **42** includes a rotatably mounted swastika-shaped turret **43** shown schematically in FIG. 1 and in detail in FIGS. 6 and 7. The turret **43** is intermittently actuated by a drive taken from the bag-making machine **32** by a chain **96** and sprocket wheel **98** which drives a suitably journalled shaft **100** on which gear **102** is mounted. Gear **102**, in turn, forms a gear train with gear **104** which drives journalled shaft **106**. A Geneva assembly is interposed between journalled shafts **106** and **108** and includes the Geneva gear **110** mounted on shaft **108** and the Geneva drive **112** mounted on shaft **106**. The Geneva gear **110** is intermittently driven by the Geneva drive **112** and rotates 90° during each cycle of motion.

Journalled shaft **108** to which the Geneva gear is affixed is thus similarly driven in 90° segments and causes the intermittent rotation of gear **114** mounted on shaft **108** and gears **116** and **118** which are driven by gear **114**. Gear **116** is mounted on suitably journalled shaft **120** and gear **118** is mounted on shaft **123**. Shaft **123** is hollow and serves as a conduit for providing air to the various compressor mechanisms of the turret assembly through a rotating union that comprises one end of the shaft. The rotating union is not depicted. The turret assembly **43** is keyed to shaft **123** by key **125** and, thus, is also driven intermittently in 90° segments by the Geneva assembly. The gear train formed of gears **114**, **116** and **118** serves to synchronize the operation of the turret assembly to that of the pusher mechanism.

Referring now to FIG. 6, it is seen that each of the four sections of the turret assembly *a*, *b*, *c*, and *d*, includes a fixed plate **122** and a movable platform **124** adapted to shift toward the fixed plate along frame member **126**. A compressor plate **128** is affixed to each movable platform and a nose plate **130** is affixed to each compressor plate. Each nose plate **130** is coupled to piston **132** which extends from cylinder **134** which, in turn, is coupled to the turret frame. The piston and cylinders are adapted to intermittently shift the movable platform **124** toward the fixed plate **122** and, in this regard, the compressor cylinders **134** are synchronized with the turret rotation so that during the course of a 180° rotation of the turret, the piston will have moved the compressor plate toward the fixed plate to compress the stack of bags **36** on the compressor plate and, thereafter, retract. Sensor **136** is provided for each section and coordinates the movement of the compressor plate with the rotation of the turret. In the depicted embodiment, the sensor **136** comprises two valve buttons mounted on the top of frame member **126** at each section and adapted to control the motion of that section and the diametrically opposed turret section. Thus, when sensor **136***c* is actuated by contracting arm **138**, the *a* turret section compressing assembly will be activated and the *c* turret section compressing assembly will be deactivated by means of suitable valving communicating with the rotating union coupled to the hollow shaft **123**. Arms **138** in turn are coupled to the main drive shaft **100** and are adapted to synchronously actuate the valves during each cycle.

The turret assembly is further synchronized with the pusher mechanism so that when pusher arm **78** is activated to push a bundle **36** toward the turret assembly, a movable platform **124** of one section of the assembly will be in position to receive the stack of bags. Thereafter, as the pusher arm **78** retracts, the turret assembly will rotate 180° counter-clockwise in two 90° indexes. At the conclusion of each 90° index, pusher arm **78** moves the next stack of bags onto the next moving platform of the transfer compressor. When that stack of bags has been rotated 180°, it is in position to be removed from the turret assembly by the second pusher arm **92** which moves in unison with arm **78**. During the course of the 180° rotation, each stack is also compressed by the action of the compressor plate **128** moving toward the fixed plate **122** under the action of the piston and cylinder. By the time the section has rotated a full 180° and the bags are rested on the fixed plate, the piston has retracted so that pusher arm **92** may push the compressed bags off the turret assembly. The procedure is repeated for each section so that with each 90° rotation of the turret assembly, a new stack of bags is pushed onto the turret assembly and a stack of compressed bags is pushed off the turret assembly onto the stack transport.

In order to square off the bags comprising each stack as they are transported to the transfer compressor from the turntable **38** a quick action patting assembly **45** is provided. The patting assembly includes a face plate **47** attached to piston **49** which extends from cylinder **51**. The cylinder in turn is fixed to the frame of the bundling machine in such a manner that the path of travel of piston **49** is substantially perpendicular to the path of pusher arm **78**. As each stack of bags **36** is pushed on to the transfer compressor turret by pusher arm **78** the piston is activated thereby causing the patter face plate **47** to tap the side of the stack of bags thereby squaring up the stack against the fixed plate **53** disposed on the opposite side of the bundling machine from the patter mechanism **45**. The activating means for the patting assembly is synchronized with the pusher mechanism so that each time a stack of bags is pushed onto the transfer compressor turret it will be squared off.

STACK TRANSPORT

The stack transport **46** is also intermittently operated and during each interval of motion is adapted to move a stack of bags received from the transfer compressor **42** a discrete distance toward the stack elevator **50**. In this regard, the stack transport includes a platform **140** extending between the transfer compressor **42** and the stack elevator **50** and a carriage **142** adapted to reciprocate along fixed guide rods **144** parallel to platform **140**. The

carriage **142** includes side members **146** and **147** and front and rear members **148** and **150**. A series of bag stack pushing arms **152** are arranged in opposed pairs at discrete intervals along the carriage and are adapted to move with the carriage. When the carriage moves toward the elevator, the opposed pairs of arms each push a stack of bags disposed upon platform **140** toward the elevator a distance equal to the distance moved by the carriage. At the end of the forward motion of the carriage, the arms swing out of contact with the stacks and the carriage returns to its initial position. During the next interval of forward motion of the carriage **142**, the pair of arms adjacent to and in front of the pair that originally moved any given stack of bags further engages the stack and moves it forward another distance. This process is repeated until the bags eventually reach the elevator **50** and, in this regard, the forwardmost pair of arms **152** are adapted to push the stack it engages onto the elevator and positioned so that the front of the stack abuts the elevator wall.

Carriage **142** is activated by drive rod **154** which is coupled to the bag-making machine drive and, thus, the carriage motion is synchronized with the other motions of the bundling machine. Drive rod **154** engages arm **158** one end of which is pivotally mounted to bracket **160** which, in turn, is mounted to the frame member **162**. Connecting rod **164** couples the other end of the arm **158** to the front cross-member **148** of the carriage. Thus, as drive rod **154** is reciprocated, the carriage **152** moves to and fro along the guides. Biasing spring **166** connects arm **158** to the frame and thereby cooperates in returning the carriage **142** to its rear-most position at the completion of each forward stroke.

As was stated, the bag pushers comprise a plurality of pairs of upstanding arms **152** adapted to push the stack of bags forward during the forward motion of the carriage (i.e., toward the lifting station) and to shift to a position out of the way of the stacks during the rearward motion of the carriage. To this end, one of each pair of arms is mounted to shaft member **146** and the other arm of each pair is mounted on the other shaft member **147**. The shaft members are journalled within the front and rear cross members **148** and **150** and are free to rotate therein. Thus, as the shaft members rotate so do the pusher arms **152**. The rotation of side members **146** and **147** is controlled by piston **168** which extends from cylinder **170** which, in turn, is mounted on cross member **148** by bracket **172**. Piston **168** engages the crank arm **174** which is keyed or otherwise coupled to shaft member **147**. The other end of crank arm **174** is coupled to cross arm **178** which, in turn. is also coupled to crank arm **180** and adapted to rotate with shaft member **146**. Thus, as piston **168** is displaced outwardly from cylinder **170**, shaft members **146** and **147** and the arms they carry will be rotated toward the platform, and as piston **168** is shifted into the cylinder, the arms rotate away from the platform **140**.

The entire stack transport is open but the arm return path is enclosed within a housing **182** which is provided with suitable openings **184** designed to permit the entrance of the arms into the housing prior to return motion of the carriage and to allow the arms to ride inside the housing when the carriage is being retracted. Cylinder **170** may be hydraulically or pneumatically operated and the activation and deactivation of the cylinder is controlled by switches **186** and **188** mounted to the front and rear of the frame, respectively. Thus, when the carriage completes its forward motion, the leading arm **152***d* will actuate switch **186** causing piston **168** to extend from the cylinder and the arms **152** to rotate away from the platform through openings **184** in housing **182**. When the carriage is returned to its rear-most position switch **188** will be activated and arms **152** will rotate back out of the housing through the openings **184**. The various stacks of bags **36** are thus pushed along the platform a distance equal to that between adjacent arms each time the carriage is activated to move in a forward direction.

STACK ELEVATOR

The stack elevator **50** receives the stacks transferred by the forward-most pair of arms **152***d* of the stack transport and operates to elevate each stack to the pivotal support mechanism **54** on which the elevated stacks are supported one above the other. As depicted in FIGS. 8, 12, 13 and 14, the forward edge of the stack transport carriage **142** is substantially interdigitated with the platform **190** of the stack elevator **50** so that the forward arm **152***d* serves to push the forward-most stack of bags onto the elevator. The stack elevator **50** includes the platform **190**, the ends of which are provided with slots **192** adapted to accommodate upstanding arm portions **194** of the stack alternator **196**. The stack alternator **196** is utilized where a "long-pack bundle" of bags is desired and serves to longitudinally shift the stacks alternately toward one side and then the other as they come off the transport. The alternator **196** includes base plates **198** and **200** suitably mounted to opposite sides of fixed guides **202** and **204** which, in turn, are mounted to the elevator frame **206**. Arms **194** are coupled to plate **198** and are adapted to move with the base plate and may be shifted into slots **192**. The alternator **196** is driven by one or more hydraulic or pneumatic cylinders **208** which are coupled to the elevator frame and include piston **210** which is coupled to the baseplate. A pair of piston-cylinder assemblies may be provided to accommodate the base plates separately or a suitable linkage may be utilized so that one piston and cylinder operates both plates. The long-pack bundle configuration is formed by shifting a first stack of bags half the distance of the bag bottom toward one end of the elevator platform and, thereafter, shifting the following stack the same distance toward the opposite end of the elevator platform. The configuration of stacks so arranged forms the "long-pack" bundle **212** depicted in FIG. 5. It should be noted that the alternator assembly **196** need not operate at all times unless so desired and in those instances where the alternator is not used a standard pack bundle of stacks **214** as depicted in FIG. 4 will result.

Referring again to the stack elevator **50**, it is noted that the transferred stack of bags **36** pushed onto elevator **50** by arm **152***d* will be caused to strike wall **216** of the machine chassis following which the stack elevator is actuated. In the event a long-pack configuration is desired, the alternator **196** will be actuated prior to the activation of the stack elevator **50**. In this regard, the movement of the stack elevator and alternator assembly are synchronized with the movement of the stack transport **46** so that the stack elevator (and alternator, if required) are actuated and returned to their initial position in time to receive the next stack of bags from pusher arms **152***d*. The elevator drive has been described in detail in the co-pending application and for the present it should be sufficient to state that linkage **218** is provided which couples the elevator raising mechanism **220** to the transport drive so that each time the carriage moves forward to push a stack of bags onto platform **190** the elevator lifting mechanism **220** is activated to raise the stack to the pivotal support mechanism **54** and, if required, the alternator may first be utilized to properly shift the stack.

PIVOTAL SUPPORT MECHANISM

The pivotal support mechanism **54** receives the stacks **36** elevated by the stack elevator **50** and maintains the stacks in a stacked relationship until such time as a predetermined number of stacks for the formation of a bundle are supported thereon. According to usual practices in the trade, 20 stacks of 25 bags each are supported on the pivotal support mechanism **54** for a 500 count bundle. However, variations may be obtained by suitably programming a counter mechanism. The pivotal support mechanism **54** is comprised essentially of a pair of pivotal plates or fingers **224** and **226** which are urged to-

ward one another by suitably applied spring biasing means **228**. The plates are pivotally mounted to the elevator frame and are adapted to pivot away from one another as the stacks **36** are elevated by the stack elevator **50** so as not to interfere with the lifting motion of the elevator. However, as the platform **190** of the stack elevator is retracted downwardly, the plates **224** and **226** resume their inner directed normal positions under the action of the biasing means and consequently are in position to engage the lowermost bag of the stack elevated thereon. This operation is continued until the desired number of stacks have been accumulated on plates **224** and **226**, at which time the bundle elevator **56** is actuated to remove the stacked bundle therefrom. It should be noted that the operation of the pivotal support mechanism **54** and bundle elevator **56** are independent of the bundle configuration and are equally well suited for regular pack or long pack bundles.

BUNDLE ELEVATOR

Following the placement of the last stack of bags on the pivotal support mechanism **54**, the bundle elevator **56** is actuated to raise and, consequently, compress the bundle **230** between the elevator base **232** and a fixed compressing plate **235**. Thereafter, the raised and compressed bundle is pushed to the banding station **60** by the bundle pusher mechanism **58**. The bundle elevator **56** is depicted in FIG. 14 and comprises a vertically shiftable frame **236** adapted to be shifted along the pair of vertically extending guide rods **238** by nose plate **240** coupled to piston **242** which extends from cylinder **244**. Cylinder **244** may be either hydraulically or pneumatically activated. Shafts **246** and **248** are suitably journalled to frame **236** and meshed gears **250** and **252** are mounted about the shafts. Upwardly extending arms **254** and **256** are also coupled to shafts **246** and **248** and the free ends of arms **254** and **256** are turned inwardly to form plates **253** and **255** which together define the base **232** of the bundle elevator. A crank arm **258** has one end coupled to shaft **246** and the other end is connected to an extension of piston rod **262**. Piston **262** extends from cylinder **264** which is rotatably mounted to portions of the elevator frame by bracket **266**. Thus, as piston rod **262** shifts out of or into cylinder **264**, plates **253** and **255** will be brought toward or away from each other. Plates **253** and **255** are thus adapted to be shifted toward one another so as to enable them to engage the lower face of the bottom-most bag supported on the pivotal support mechanism when the frame **236** is shifted vertically. After the bundle is raised the necessary distance and removed from the bundle elevator, plates **253** and **255** are spread apart as the frame is lowered so as not to interfere with the next bundle being formed on the pivotal supports.

PUSHER MECHANISM

The compressed bundle will now be shifted to the banding station **60** upon the actuation of the pusher mechanism **58**. As will be apparent to those skilled in the art, the actuation of cylinder **244** and **264** may be triggered by a counting mechanism which, in turn, may be actuated by a switch associated with wall **216** or by the rotation of one or more of the drive systems.

The compressed bundle is shifted to the banding station **60** by the pusher mechanism **58**, the actuation of which may be triggered by a switch which is closed following the raising of the bundle by the bundle elevator **56**. The elevated and compressed bundle **57** is held momentarily at the raised position by the bundle elevator **56** until such time as the pusher mechanism has had an opportunity to remove the compressed bundle and transfer it to the banding station **60**. Following this transfer, the bundle elevator plates are separated and the elevator is lowered to its retracted position so that the cycle may be repeated without interfering with the stack elevator operation.

In essence, the pusher mechanism **58** comprises two spaced arms **268** suitably coupled to the free end of a piston rod extending from a cylinder which may be pneumatically or hydraulically actuated toward or away from the banding station **60**. The pusher mechanism **58** retracts and is ready for the next elevated compressed bundle after pushing a bundle from the elevated position to the banding station **60**. The pusher arms **268** are also vertically adjustable in a manner that will be explained forthwith. After the bundle is raised by the second elevator and compressed between the elevator and compressor plate **235**, pusher mechanism **58** transfers the compressed bundle **57** to the banding station **60**.

The compressor plate **235** forms a part of the "movable head" **231** shown in FIG. 19 and is adapted to be shifted vertically with respect to the bundling machine frame with the head **231**. In this regard, the head **231** is coupled to fixed threaded rod **237** in such a fashion that as rod **237** is rotated in one direction, the head **231** will lift and when the rod is rotated in the opposite direction, the head will be lowered. To this end, the ends **239** and **241** of rod **237** are suitably journaled relative to the bundling machine frame. A worm gear **243** is mounted to the top end **241** of rod **237**. Worm gear **243** in turn engages a driving worm **245** which is driven by motor **247**. Motor **247** is activated by switch **249** (shown in FIG. 12) which is affixed to the frame below alternator **196**. The motor is wired so that once elevator **56** is activated, unless switch **249** is opened within a preset time, head **231** will be raised. To this end switch **249** includes a detent **251** which is adapted to be depressed by the upper surface of housing **257**. Housing **257** comprises a portion of the bundle elevator **56** and will rise with the elevator in the manner already described. Switch **249** is ordinarily closed in a position to cause motor **247** to raise plate **235**. However, detent **251** serves to open switch **251**. Thus, once the elevator starts rising, unless detent **251** is depressed by its interengagement with the shaft housing **257**, the motor **247** will be activated to raise head **231** including compressing plate **235** until detent **251** is depressed.

Under normal circumstances, the vertical dimension of the predetermined number of stacks of bags comprising a bundle is known so that the compressor plate **235** may be preset at the proper distance from the base of elevator **56** so that after the bundle is raised by the second elevator, it may be compressed between the elevator base and compressing plate **235** without interfering with the operation of pusher **58**. This may be accomplished by suitably positioning the moving head **231** as described above. However, if for some reason, the height of the bundle **57** exceeds the normal distance, as for example, if one or more stacks contain an abnormally large count or if the caliber of stock from which the bags are produced is varied, the excess material will prevent the shaft housing **257** from contacting detent **251** and hence motor **247** will activate threaded rod **237** to raise head **231** and hence plate **235**.

As was previously mentioned, the arms **268** of the pusher mechanism are also adjustable to permit the arm length to increase or decrease as head **231** is raised or lowered. To this end, the arms **268** include elongated center member **370** sandwiched between inner and outer plates **372** and **374** as shown in FIG. 20. Suitable slots and a key **376** are provided to secure the center member **370** to the outer plates while permitting vertical movement. A strip of magnetized material **378** cooperates in securing the outer section between the plate while permitting vertical movement. The lower end **380** of arm **268** engages rod **382** which (as seen in FIG. 12) is fixed relative to head **231** while the remainder of the pusher is free to move with the head. Thus, as the head is raised or lowered, the length of pusher arm **268** will likewise change.

BANDING STATION

The banding station **60** includes three spaced apart plates **270**, **272** and **274**. The lower plate **270** is adapted

to secure the bundles of bags **57** from the bundle lift **56** while the upper plate **274** supports a length of wrapping material **276** during the initial stages of the banding procedure. A length of material **276** is fed onto the top plate **274** from web **278** and is guided into position by free roller **280** and drive roller **284**. A nonslip clutch roller **282** serves to prevent the length of material **276** from falling back into the web **278**. The length **276** is severed from web **278** by knife **286**, which is shown in detail in FIG. 21. In this connection, knife **286** is mounted to chain **287** which in turn is driven by sprocket **360** which forms part of the moving head **231** which is depicted in FIG. 19 and which will be described in detail forthwith. A rack **362** is affixed to the bundling machine and extends vertically parallel to screw **237** in engagement with sprocket **360**. Thus, as the movable head **231** is raised, sprocket **360** will be caused to rotate in a counterclockwise direction and conversely as the head is lowered, sprocket **360** will rotate in a clockwise direction. Thus, as the head is shifted vertically, the knife **286** will move the same distance horizontally. This arrangement enables the use of a minimum amount of wrapping material regardless of the dimensions of the bundle to be wrapped.

Reference is now made to FIG. 21 wherein the details of knife **286** are shown. In this regard, knife **286** includes an upper male portion **364** and a mating lower female portion **366**. Both the male and female portions are mounted to a sliding block **368** which is adapted to slide along rod **384** which in turn is disposed parallel to chain **387**. The block **368** is secured to chain **387** by suitable fasteners. Thus, as chain **387** shifts, the sliding block **368** and associated knife **286** will also shift. The male portion **364** of knife **286** is mounted to a support **386** which in turn is coupled to an activating means **388**. The female portion **366** of knife **286** is mounted to support member **390** the forward portion **392** of which forms a ramp to guide the banding material between the male and female parts. Strut members **394** and **396** serve to connect the male and female portions and to allow the one to move with the other. In operation, when a sufficient length of banding material has been unraveled from the web **279**, the knife **286** is activated by bringing the male portion **364** into contact with the female portion **366** thereby severing the banding material **276** from the web. It is to be noted that the knife blade **398** tapers downwardly toward both edges from a raised crown portion. Thus, as the knife is activated, the center of the web material is first pierced followed by a gradual piercing of the remainder of the material across the web. An electric eye **290** is positioned along the path of the web **278** and is adapted to deactivate the paper feed rollers **284** when a length of material sufficient to wrap a bundle is draped over the forward edge of the plates by stopping motor **289** which drives roller **284** through chain **291**. In order to take up any excess banding material that will be available if the head is lowered, as for example when a temporary increase in the caliber of stock for bags has been corrected, a dancer **400** with its associated pulleys, is interposed between the wrapper web **278** and drive roller **284**. To this end roller **282** is air loaded and cyclically released to allow action by dancer **400**.

Thus, the free edge of web **278** is guided over plate **274** through knife **286** and draped over the spacing between plates **270** and **272**. The first step in the wrapping process is depicted in FIG. 11*a* wherein the sheet guides **330** and **332** shown in FIG. 11*g* in the closed position are caused to separate to the open position of FIG. 11*a* and glue flap **328** comes down upon completion of the preset bundle count. Thereafter, pusher arm **268** transfers a compressed bundle of bags from the base **232** of bundle elevator **56** by pushing the bundle against the length of wrapping material **276**. Immediately prior thereto, knife **286** was activated to sever length **276** from the remainder of the web **278** so that as bundle **57** is pushed onto plate **270**, the length of banding material will extend over the bundle forward face **292** and top and bottom faces **294** and **296**.

For the time being, the top trailing flap **298** will continue to rest on top plate **274** and the bottom trailing flap **300** extends along lower plate **270** extending toward the pusher arm **268**. The piston actuated top trailing flap folding member **302** is then shifted downwardly as shown in FIG. 11*c* assisting the top trailing flap **298** to fall down over the fourth side **304** of the bundle. Member **302** comprises a horizontal rod connected to a piston extending from a set of cylinders. Prior to the activation of rod **302**, the pusher arms **268** are retracted so as not to interfere with the rod. Tacking plates **306**, which are coupled to pistons extending from a set of cylinders **308**, are then activated to assist to secure the top flap **298** against the fourth side **304** of the bundle **57**. Plates **306** are positioned with respect to the pusher arms **268** so as not to interfere with the pusher movement. It should be noted that the length of material **276** was cut from the web so that the length of top flap **298** is substantially equal to the height of the bundle, thereby causing the top flap to extend to but not beyond lower plate **270**. With tacking plates **306** in position securing the top flap to the fourth side **304** of bundle **57**, top sheet wiper **310** is lowered as shown in FIG. 11*d*. As shown in FIG. 18, sheet wiper **310** comprises a series of spaced apart rods **312** depending from the top member **314** which is adapted to be shifted along guide rods **318** and **320**. The sheet wiper's movement is governed by piston **316** extending from cylinder **322** which is secured to head **231** and adapted to move therewith. An adhesive applicator **324** is provided which may be activated to apply a suitable glue or adhesive to the bottom trailing flap **300** prior to the upward folding of the bottom trailing flap. The gluer **324** may include dispensing jets **326** as shown in FIG. 11*e* or it may be of the roller or valve type. The depicted gluer is preferred since it lays down a glue pattern giving even distribution across the paper. The gluer is a slidably mounted chain driven mechanism which traverses the lower flap **300** in synchronization with the top flap folding equipment previously described so that after sheet wiper **310** is lowered, the lower flap **300** is in condition to be flipped up and adhesively secured to the lower edge of the upper trailing flap **298**. Thus, after the gluer mechanism **324** has completed traversing the lower flap **300**, the bottom trailing flap folding plate **328** which is pivotally connected to the free end of lower plate **270** is pivoted upwardly as shown in FIG. 11*f* and forces the bottom trailing flap **300** against the upper trailing flap **298**. The two flaps are secured to one another by means of the interposed adhesive. The flap folding plate **328** may be actuated by hydraulic or pneumatic means which are not depicted. The flap folding plate is retained in its upward position while tuck plate **308**, top flap guide **302** and sheet wiper **310** are returned to their initial positions. Bottom sheet guide **330** and upper sheet guide **332** are then activated to guide a new length of material **333** into position to wrap the next bundle. Upper sheet guide **332**, as shown in FIG. 17, comprises a series of spaced fingers on rods **334** adapted to be vertically shifted. Rods **334** are affixed to plate **336** which rides on guides **338**. Guides **338** are affixed to upper and lower frame members **340** and **342** (the latter forming a part of compression plate **235**) which are secured above top plate **274** which has a curved forward edge **275** as shown in FIG. 16. Lower frame member **342** is provided with suitable openings **344** which permit rods **334** to shift below top plate **274**. It may be noted that the sheet wiper **310** is also affixed to upper frame member **340** and depends therefrom. Lower sheet guide **330** is constructed somewhat similar to the upper guide and in this regard includes a plurality of upstanding rods **346** coupled to a base plate **348**. The upper and lower sheet guides will move vertically with the movable head **231**. A linkage **350** is also coupled to plate **348** and to one end of pivot-

ally mounted arm **352**. Arm **352** is also linked to piston rod **354** which extends from cylinder **356** so that as piston **354** extends, plate **348** and rods **346** will shift upwardly. Rods **346** are adapted to pass through suitable openings **358** in portions of the flap folding plate **328**. Thus, when guides **330** and **332** are raised and lowered, respectively, they will form a convenient path for the banding web to follow. When a sufficient length of banding material has unravelled from the web, guides **330** and **332** are retained until the process is repeated as described in conjunction with FIGS. 11*a* through 11*f*. This also serves to move the previous bundle further along plate **270** retaining its compressed width under plate **274** while retaining the glue flap **300** secure while the adhesive sets.

SUMMARY

Thus, it will now be apparent that an apparatus is provided for automatically stacking bags when received from the discharge end of a bag making machine for subsequent conveyance to a banding station in the form of a bundle of stacks of bags that are compressed for purposes of assuming a minimum amount of space. Thereafter, the compressed bundle is banded by simply overlapping and adhesively securing the marginal ends of the banding material. In accordance with a successful embodiment of the invention, approximately one bundle was banded per minute and the banding machine was capable of taking care of the output of one paper bag making machine. Thus, the several aforementioned objects and advantages are most effectively obtained. Although a somewhat preferred embodiment of this invention has been disclosed and described in detail therein, it should be understood that the invention is in no sense limited thereby and its scope is to be determined by that of the appended claims.

Having thus described the invention, what is claimed is:

1. A bundle banding machine comprising:

a stacker for stacking a plurality of substantially flat articles;

transfer and compressor means for transferring the stacks away from the stacker and simultaneously compressing the stacks to remove most of the air entrapped between adjacent articles;

a stack elevator for receiving the stacks transferred by the transfer means and for positioning each stack at a different elevation;

support means for supporting one stack upon another at the different elevation to form a bundle of these stacks; and

banding means for banding the bundle of stacks.

2. The invention in accordance with claim **1** wherein the transfer means includes a turntable for receiving each of the stacks and then turning each stack to a predetermined orientation for bundling.

3. The invention in accordance with claim **2** wherein the transfer means further includes a turret assembly adapted to receive each of said stacks from the turntable and to invert each of said stacks so that the article forming the bottom of any stack received by the turret assembly forms the top of the stack leaving the turret assembly.

4. The invention in accordance with claim **3** wherein the transfer means further includes a stack transport and means for transferring each of said stacks from the turret assembly to the leading end of the stack transport and means for transferring each of the stacks from the trailing end of the stack transport to the stack elevator.

5. The invention in accordance with claim **1** wherein bundle compressing means are interposed between the stack elevator and the banding means for compressing the bundle to a predetermined volume prior to banding the bundle.

6. The invention in accordance with claim **5** wherein said comprising means include an adjustable member whereby adjustment of said member permits said predetermined volume to be varied.

7. The invention in accordance with claim **1** wherein said stack elevator includes means for longitudinally shifting alternate stacks alternately toward one end of the adjacent stacks and then the opposite end.

8. A bundle banding machine comprising:

a stacker for stacking a predetermined number of substantially flat products into a stack including means for transferring each of the stacks to a first location;

a turntable at said first location for receiving each of the stack transport and lifting each stack to an elethen turning each stack to a predetermined orientation for bundling;

a pusher mechanism for transferring each of the predeterminately oriented stacks from the turntable to a second location;

a turret assembly at the second location for receiving each of the stacks transferred by the pusher mechanism inverting each of the stacks and simultaneously compressing the same to remove most of the entrapped air and then transferring each stack to a third location;

a stack transport having a leading end at the third location for receiving each of the stacks transferred from the turret assembly and then transferring each stack to a fourth location;

a stack elevator at the fourth location for receiving at a lowered position each of the stacks transferred by the stack transport and lifting each stack to an elevated fifth position;

a support mechanism at the elevated fifth position for receiving each of the stacks elevated by the stack elevator and supporting the elevated stacks in a stacked relationship for forming a bundle of a predetermined number of the stacks;

a bundle elevator for elevating at least the lowermost stack of each bundle off the support mechanism and compressing the bundle at an elevated sixth position to a predetermined volume;

a pusher mechanism at the sixth position for transferring the compressed bundle to a banding station; and

banding means at the banding station for banding the compressed bundle.

9. The invention in accordance with claim **8** wherein the banding machine is designed to receive the product directly from the product making machine and stripping means interposed between the stacker and the product making machine for stripping the product as it is made and directing it onto the stacker.

10. The invention in accordance with claim **9** wherein the product is a bag having side panels and a bottom folded to face one side panel and an open top, the product making machine is a bag-making machine which produces the bags with the side to which the bottom is folded facing downwardly, the turntable is operative to have alternate stacks with their tops and bottoms facing in the same direction but different from the adjacent stacks, and the turret assembly is operative to invert the bags so that the side panels to which the bottom is folded face upwardly.

11. The invention in accordance with claim **8** wherein the turret assembly is formed of four sections, each section having a fixed plate and a movable platform and the turret assembly is adapted to receive the stacks on the platform and to compress the stacks by shifing said platform to said fixed plate.

12. The invention in accordance with claim **8** wherein drive means are associated with the stack transport for intermittently operating the transport.

13. The invention in accordance with claim **8** wherein the stack transport includes means for moving a stack from the turret assembly toward the elevator in discrete intervals, the last interval encompassing portions of said stack elevator.

14. The invention in accordance with claim 13 wherein said stack transport includes a platform extending between said third and fourth location adapted to receive the stacks transferred from the turret assembly and means for pushing the stacks along said platform from the third location to the fourth location.

15. The invention in accordance with claim 14 wherein said pushing means includes a movable carriage mounted on guide means extending between said third and fourth locations, and a plurality of upstanding arms shiftably mounted to said carriage and adapted to move therewith, said arms being shiftable from a first position wherein the arms engage the stacks on said platform to a second position wherein said arms clear said stacks, and means for shifting said arms from said first position to said second position.

16. The invention in accordance with claim 15 wherein said carriage reciprocates between said third and fourth location, said arms are longitudinally disposed along said carriage, and the arms are adapted to be shifted to said first position during the forward motion of said carriage and to said second position during the rearward motion of said carriage whereby said arms engage said stacks during the forward motion of said carriage and push said stacks in discrete intervals along said platform.

17. The invention in accordance with claim 15 wherein said carriage is generally rectangular and includes front and rear members slidably mounted to said guide means and side members extending between said front and rear members and adapted to rotate with respect thereto, said arms are arranged in opposed pairs affixed to said side members, and means for affecting the simultaneous rotation of said side members in opposite directions.

18. The invention in accordance with claim 8 wherein the support mechanism includes a pair of pivoted plates spaced from one another, biasing means for urging the plates towards one another to an elevated stack supporting position, said plates defining means for supporting the elevated stacks thereon and said stack elevator means adapted to travel between the pivotal plates during elevation of a stack of the product to cause the stack on the elevator to cause the plates to pivot away from one another and when the stack is beyond the plates, the plates are adapted to return to the stack supporting position at which the elevated stack is adapted to be supported thereby.

19. The invention in accordance with claim 8 wherein the banding means includes a web of banding material, cutting means for cutting a predetermined length of web, means for applying the length of web about the compressed bundle with the ends of the length of the web arranged in overlapping relationship and glue applying means for applying glue to the length of web along a location interposed between the overlapping ends in order

that the length of web will band and maintain the bundle in the compressed condition.

20. The invention in accordance with claim 19 wherein said banding means includes a platform adapted to receive a bundle, means for vertically draping said predetermined length of web over said platform, and means for directing said pusher mechanism toward said length of web whereby the compressed bundle is adapted to be driven into the length of web to initiate the folding of said length of web about said bundle.

21. The invention in accordance with claim 19 wherein the pusher mechanism is adapted to drive a compressed bundle into the length of web to initiate the folding of the length of web about the compressed bundle at the banding station, whereby the length will be applied over the front face and top and bottom ends of the compressed bundle with the length of web having rearwardly extending top and bottom trailing flaps, a reciprocal plate for folding downwardly about the rear face of the compressed bundle the top trailing flap of the length of web, means for maintaining said top trailing flap against said rear face and a pivotal plate for thereafter folding the bottom trailing flap over the top trailing flap to complete the banding of the compressed bundle and a glue applying mechanism for applying glue to inner faces of the lower trailing flap prior to its folding over the top trailing flap.

22. The invention in accordance with claim 8 wherein said stack elevator includes a stack receiving platform and means for longitudinally shifting stacks received on said platform alternately toward one end and then toward the other end prior to lifting each such stack to said elevated position whereby to form a "long pack" bundle at said elevated position.

23. The invention in accordance with claim 8 wherein said compressing means include an adjustable member whereby adjustment of said member permits said predetermined volume to be varied.

24. The invention in accordance with claim 23 wherein said pusher mechanism at the sixth position comprises an elongated member and the length of said member is adapted to be varied to correspond to said adjustable compressing means.

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