March 22, 1966 L. W. CHUNDELAK, JR 3,241,287

APPARATUS FOR STRAPPING PACKAGES

Filed Aug. 14, 1962 5 Sheets-Sheet 1

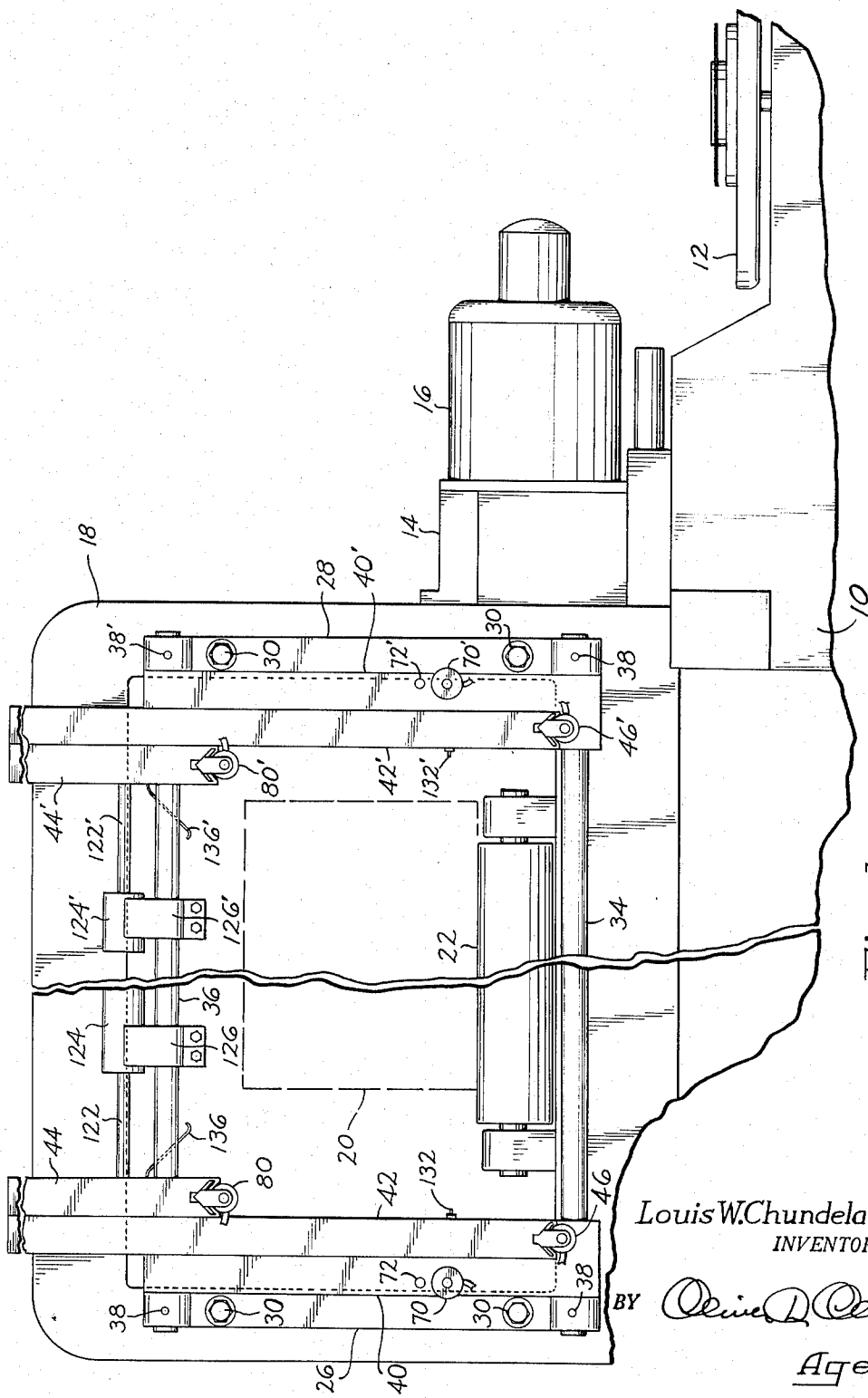


Fig. 1.

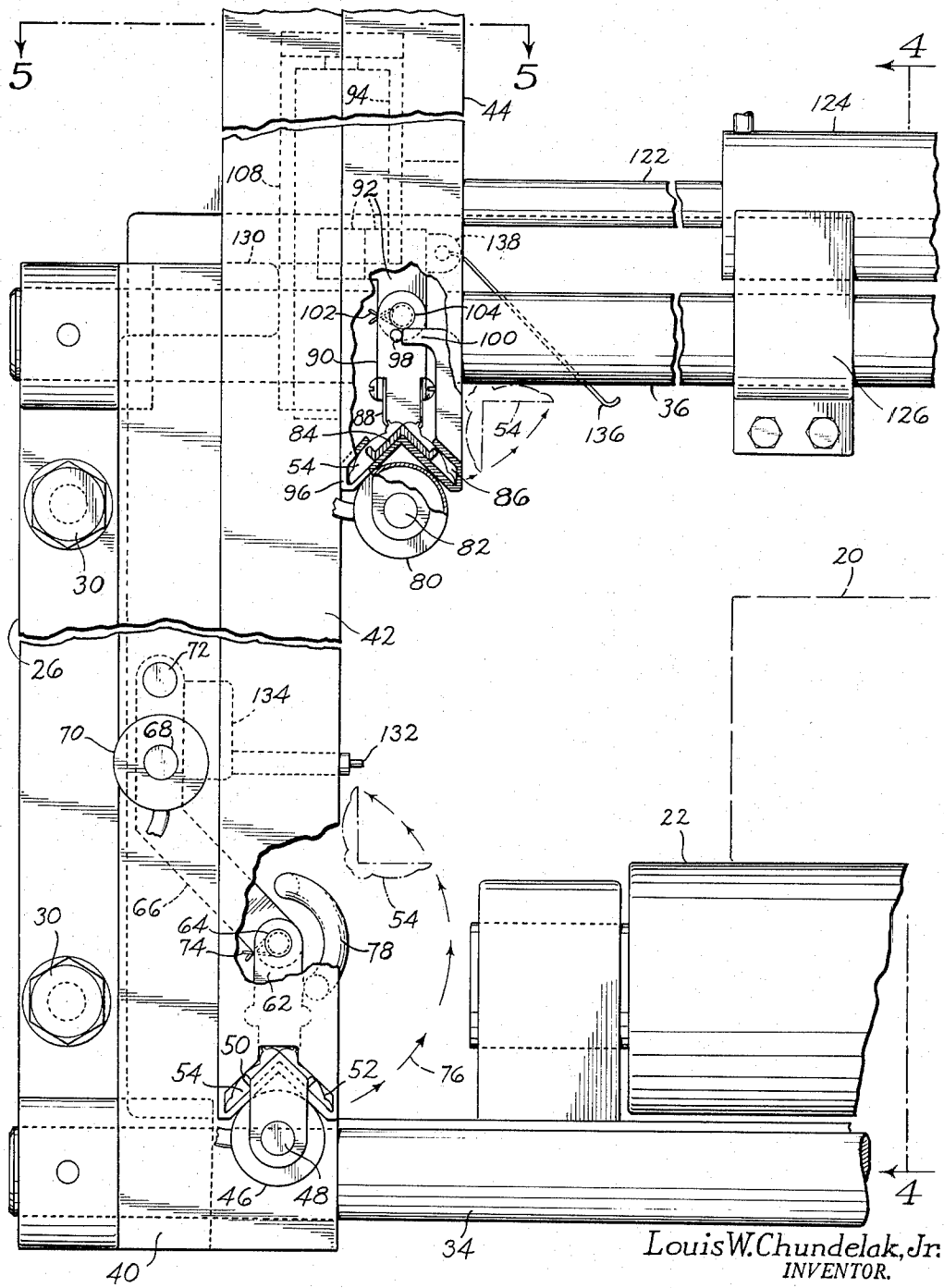
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APPARATUS FOR STRAPPING PACKAGES

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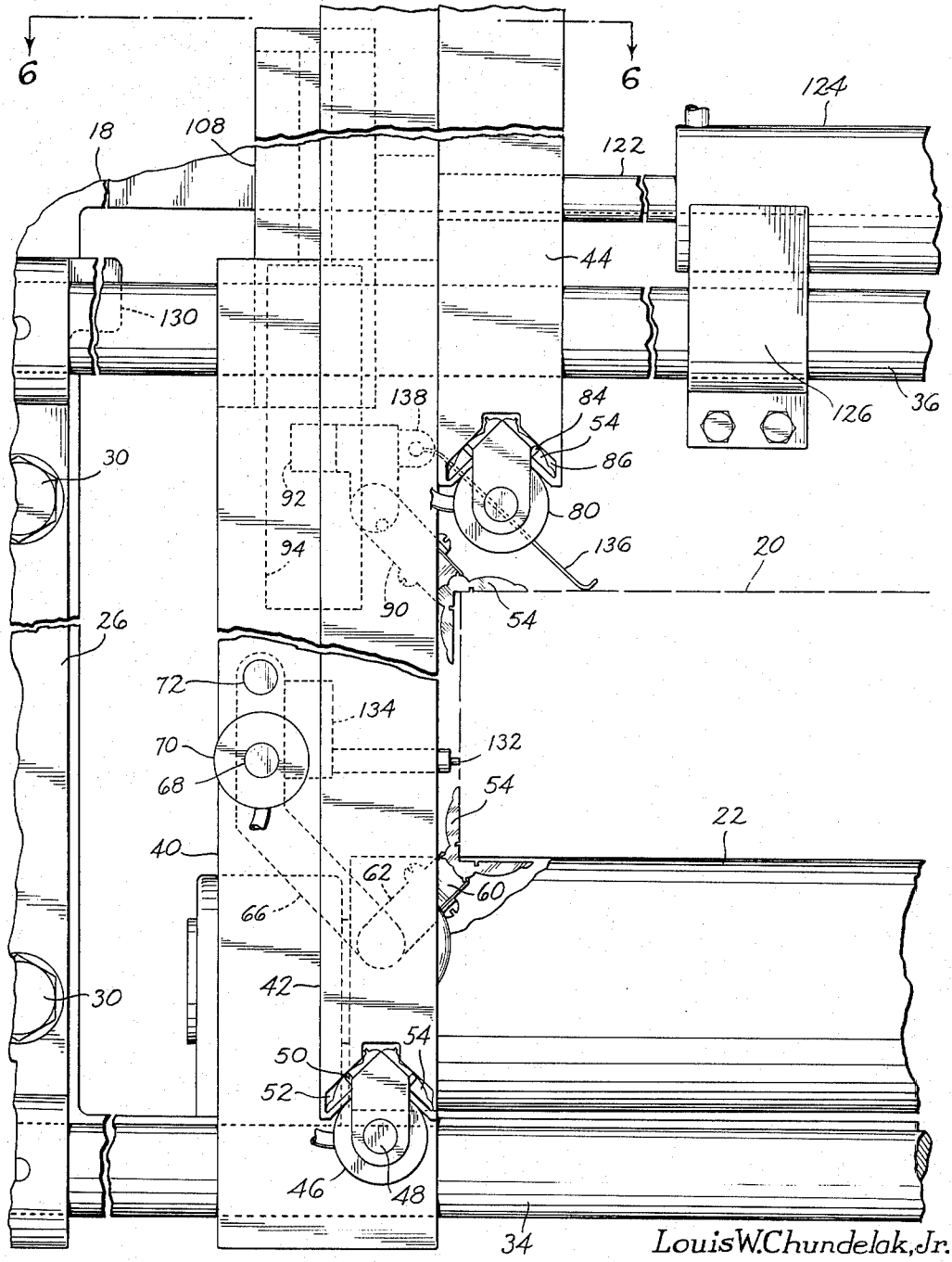
Fig. 2.

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Fig. 3.

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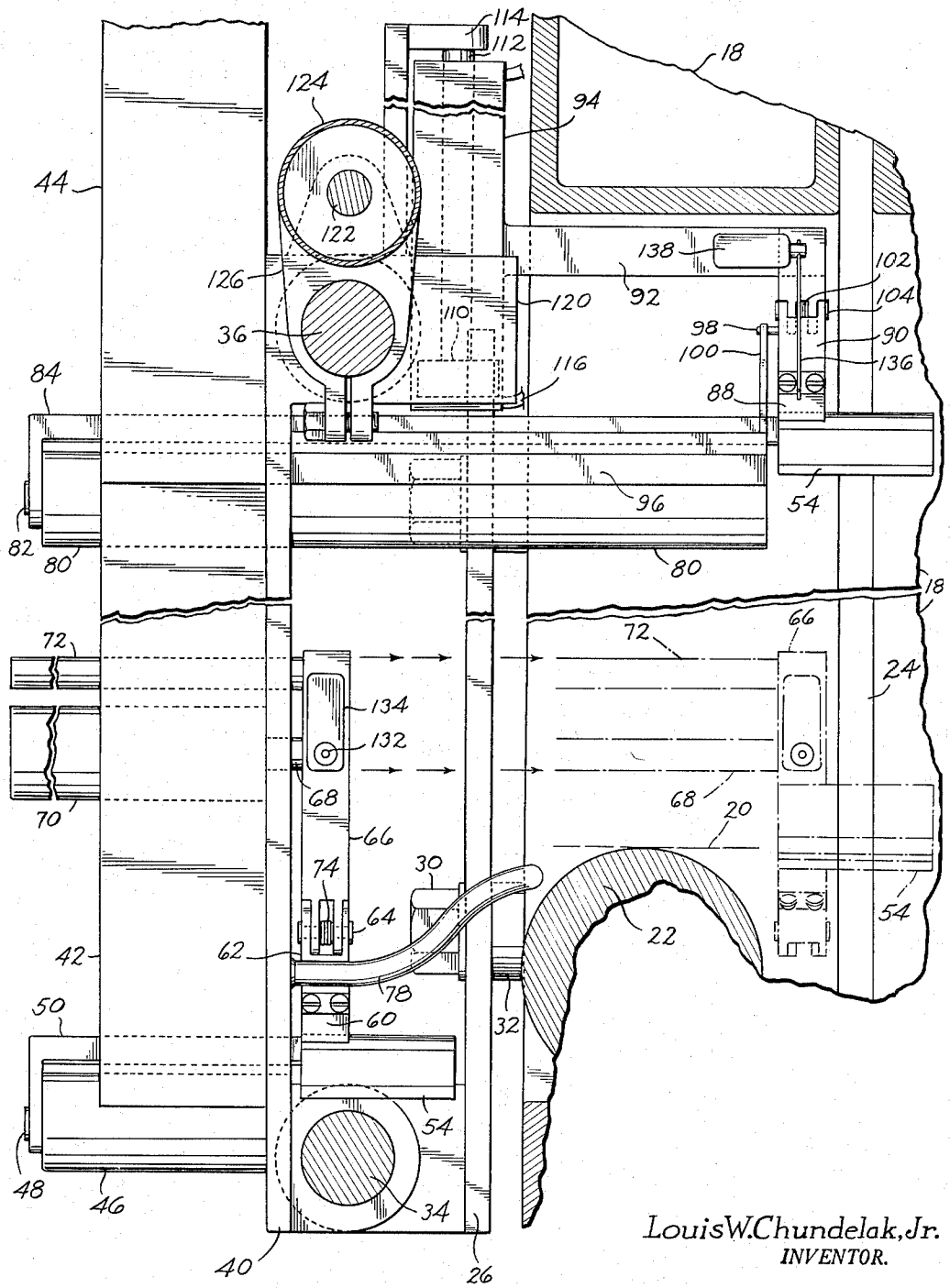


Fig. 4.

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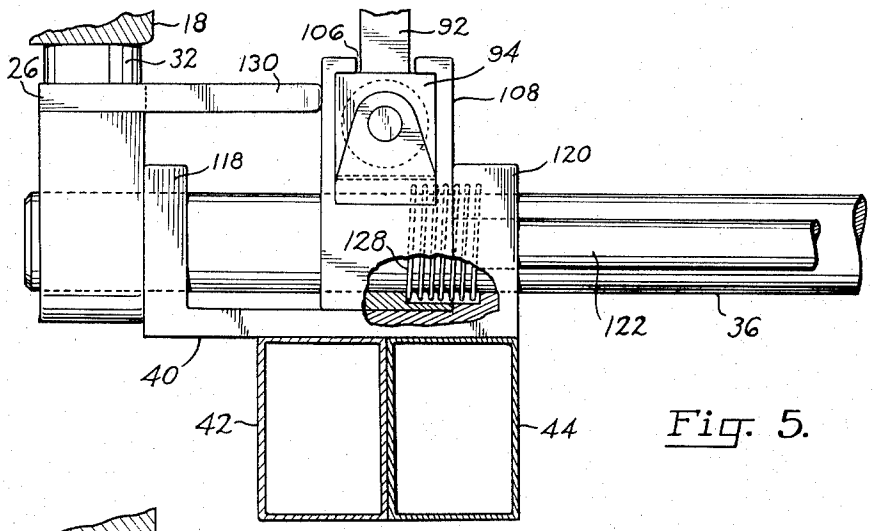


Fig. 5.

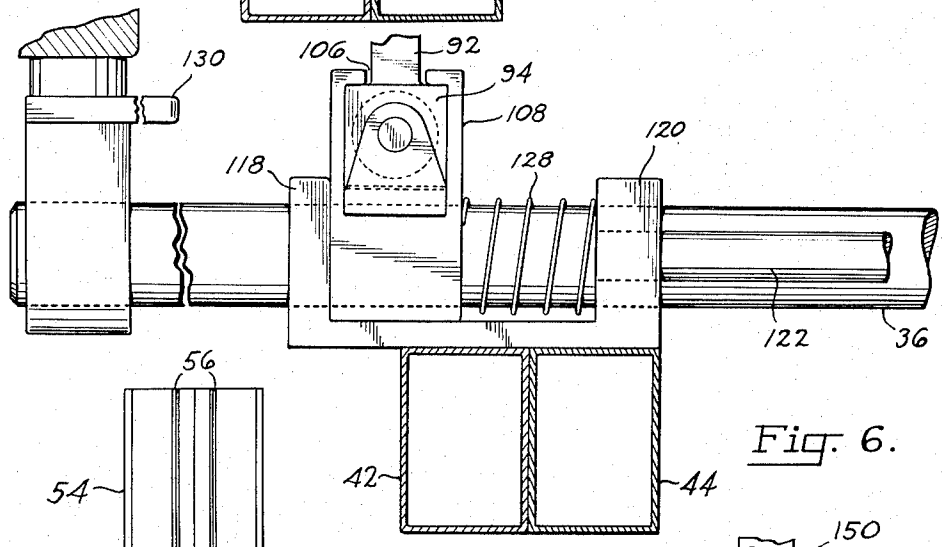


Fig. 6.

Fig. 7.

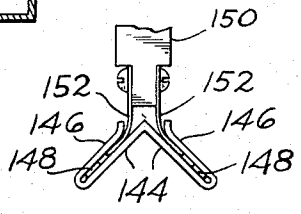


Fig. 10.

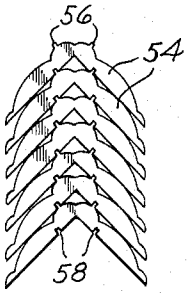


Fig. 8.



Fig. 9.

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3,241,287

APPARATUS FOR STRAPPING PACKAGES

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Filed Aug. 14, 1962, Ser. No. 216,926
7 Claims. (Cl. 53—128)

This invention relates to the strapping of packages, bundles and other articles with encircling bands of metal, and more particularly to apparatus for positioning edge protector pads at the edges of an article in the plane of an encircling strap preliminary to strapping.

The art of packaging articles of manufacture has developed to include many articles of heavy and bulky nature which require reinforcement by encircling bands of steel or other suitable material. Because of the reinforcement requirement, such bands become tightened to the extent that their constricting pressures collapse or crush the article at the edges. This occurs, for example, in the packaging of stacks of veneers, plywoods, hardboards, and other products, resulting in downgrading or destruction of the products for their intended purpose. Accordingly, it is a general practice to interpose edge protector pads between the edges of such packages and the strap to protect the edges from damage.

The application of such protective pads has been made heretofore by hand, that is, by manually positioning and holding a plurality of pads one at each edge of the package, until the strap has been tightened sufficiently to hold the pads in place. It will be apparent that such an operation obviously is economically disadvantageous, because the time consuming procedure requires at least two operators to position and hold the pads and a third to operate the strapping machine. Moreover, with the high speed strapping machines presently in use the operation is quite hazardous to those holding the pads. Further, because of the slowness with which the pads are positioned manually, much of the advantage of high speed, automatic or semi-automatic strapping is nullified.

It is the principal object of the present invention to provide apparatus by which edge protector pads may be positioned rapidly and precisely at the edges of a package in the plane of an encircling strap, preliminary to application of the strap.

Another important object of the present invention is the provision of apparatus by which edge projector pads may be applied automatically to the edges of packages of varying dimensions.

Still another important object of this invention is to provide apparatus of the class described which is adapted for use with various commercially available automatic and semi-automatic strapping machines.

A further important object of the present invention is to provide a novel edge protector pad adapted for use with the aforementioned positioning apparatus.

A still further important object of this invention is the provision of apparatus of the class described which is of relatively simplified construction for economical manufacture and which is capable of continued operation with a minimum of maintenance and repair.

The foregoing and other objects and advantages of this invention will appear from the following detailed description, taken in connection with the accompanying drawings in which:

FIG. 1 is a fragmentary foreshortened end elevation showing mounted on a conventional strapping machine a protector positioning apparatus embodying the features of the present invention;

FIG. 2 is a fragmentary foreshortened view, partly in section, of the left hand fragment of FIG. 1, disclosing further structural details, the components being shown in

solid lines in fully retracted position and in dash lines in an intermediate position of extension;

FIG. 3 is a view similar to FIG. 2 showing the arrangement of components in the fully extended position determined by the configuration of a package to be strapped;

FIG. 4 is a fragmentary foreshortened sectional view taken along the line **4—4** in FIG. 2;

FIG. 5 is a fragmentary sectional view taken along the line **5—5** of FIG. 2;

FIG. 6 is a fragmentary sectional view taken along the line **6—6** of FIG. 3;

FIG. 7 is a plan view of an edge protector pad embodying features of the present invention;

FIG. 8 is an end elevation showing a plurality of the edge protector pads of FIG. 7 interconnected in a stack; and

FIGS. 9 and 10 are fragmentary end elevations showing modified forms of edge protector pads and associated supports, adaptable for use in the apparatus of the present invention.

Referring primarily to FIG. 1 of the drawings, the automatic strapping machine illustrated therein includes a base frame **10** which supports one or more strapping supply spools **12** which is threaded through a feeding mechanism **14** driven by the motor **16**. A strapping loop guide frame **18** also is supported on the main frame. The guide frame forms a central opening for the passage of a package **20** therethrough for strapping. The package is supported upon longitudinally spaced live or idle rolls **22** which extend through the central opening.

The guide frame is provided with an annular groove **24** (FIG. 4) which guides metal strapping from the feeder **14** counterclockwise around the central opening, the terminal end of the strap being brought back to underlap the strapping adjacent the feeder where the lapped sections of the strapping are joined together by a sealing clip.

In the embodiment illustrated in the drawings, the edge protector positioning apparatus of the present invention is adapted to be integrated with the strapping machine, as an attachment thereto. The apparatus includes the pair of vertical frame members **26, 28** mounted on the outboard and inboard vertical sections, respectively, of the strapping guide frame **18**, as by means of the bolts **30**. In the event the vertical sections of the strapping guide frame are not parallel to the guide groove **24**, spacers **32** may be interposed between the frame sections in order that the frame members **26, 28** may be made parallel to the guide groove.

The vertical frames are provided at their opposite ends with hollow mounting blocks which removably support the opposite ends of the vertically spaced, horizontal guide rods **34, 36**. These are secured to the blocks by such means as the set screws **38**. The horizontal guide rods support substantially identical outboard and inboard protector positioning assemblies which function to position edge protector pads at the bottom and top edges of the outboard and inboard sides, respecively, of a package. Accordingly, the following description will relate to the outboard assembly, and the same structural components for the inboard assembly will be identified by like reference numerals but distinguished by means of the prime superscript.

A carriage member **40** is mounted at its top and bottom ends on the horzontal guide rods **34, 36** for sliding movement relative thereto. The carriage supports a pair of vertically elongated hoppers **42** and **44** each adapted to carry a supply of edge protector pads. The outer hopper **42** terminates at its lower end adjacent the lower horizontal guide rod **34**, and the inner hopper **44** terminates at its lower end adjacent the upper horizontal guide rod **36**.

The lower end of the outer hopper 42 and carriage 40 supports a fluid operated cylinder 46, the piston rod 48 of which supports the elongated W-shaped feed arm 50. The arm reciprocates through aligned slots 52 adjacent the bottom of the end walls of the hopper 42, and on the forward stroke thereof it pushes the bottommost edge protector pad 54 from the hopper for engagement by a pad support, as follows:

Referring first to FIGS. 7 and 8 of the drawings, the protector pad illustrated therein is formed of a synthetic thermoplastic resin, preferably by injection molding. The body is formed in a generally L shape with the inner surfaces converging to an apex which forms an included angle of 90°. The outer surface may be of any general configuration, btu is preferred that the thickness of the body be greater at points displaced on opposite sides of the apex than at the apex, in order that the maximum pressure exerted by the strapping be displaced to opposite sides of the apex.

Projecting ribs 56 extend in the longitudinal direction of the pad at opposite sides of the apex, diverging outward with respect to each other. Complementary grooves 58 are formed in the inner surface of the body at opposite sides of the apex, and these grooves are dimensioned to receive the projecting ribs of a second pad. Accordingly, a plurality of pads may be connected together in a long stack, by snapping the projecting ribs of one pad into the complementary grooves of an adjacent pad. Alternatively, the interconnection may be made by sliding the projecting ribs 56 of one pad longitudinally through the complementary grooves 58 of an adjacent pad.

Detachment of the lowermost pad of the stack contained within the hopper is effected by the feed arm 50 by sliding the projecting ribs through the grooves of the overlying pad. As the lowermost pad is ejected from the hopper, its leading end passes between downwardly projecting, laterally spaced resilient clips 60 which are mounted upon the opposite sides of a clip head 62. The projecting ends of the clips are turned inward to engage under the outwardly diverging ribs 56 on a pad, whereby to secure the latter between the clips. As best illustrated in FIG. 4, the ejector arm 50 is extended forwardly to a position immediately adjacent the clips, whereby the pad projects a substantial distance beyond the clips, for purposes explained more fully hereinafter.

The clip support head 62 is mounted pivotally, by means of the pin 64, on the offset end of the support arm 66. The opposite end of this arm is mounted upon the projecting end of the piston rod 68 associated with the fluid cylinder 70 supported by the carriage 40. A guide rod 72 projecting from the arm 66 through a guide opening in the carriage, maintains the arm against rotation, but permits the arm to move with extension and retraction of the piston rod.

A coil spring 74, mounted on the pivot pin 64, engages at its opposite free ends the clip support head 62 and the head support arm 66, respectively. The spring is arranged to urge the head pivotally in the direction of the arrows 76 in FIG. 2, as explained in detail hereinafter. However, in the position of full retraction of the head and arm, as indicated by the solid lines, the head 62 is held in the downward position of rotation by engagement with the rearward end of the elongated helical cam rod 78 which projects forwardly from the carriage 40. In this position the clips 60 are aligned with the hopper slot 52 for receiving a pad 54.

As the piston rod 68 is extended, by operation of the fluid cylinder 70, the resilient pressure of the spring 74 urges the head against the cam and permits the head to rotate upward, guided by the cam, until it reaches the position indicated in dash lines. The extent of this rotation is 135° and, as indicated in FIG. 2 places the protector pad in proper alignment with the lower outboard edge of the package 20 to be strapped. This rotation occurs outward of the bearing mounting for the conveyor roll 22 before the carriage is moved inward toward the package. Following this rotation the cylinder 70 continues to extend the clip head 62 to a predetermined position at which the protector pad traverses the plane of the annular guide groove 24 for the strapping.

The lower end of the upper hopper 44 supports a fluid operated cylinder 80, the piston rod 82 of which supports the feed arm 84 which is reciprocated through aligned slots 86 adjacent the bottom of the end walls of the hopper for ejecting the lowermost protector pad 54 forwardly into engagement with the spaced clips 88 carried by the head 90. However, in this instance the head is maintained in a fixed position adjacent the plane of guide groove 24 (FIG. 4) by means of the supporting arm 92 which is mounted upon the fluid operated cylinder 94. Accordingly, the feed cylinder 80 projects forwardly through the carriage, and that projecting portion of the cylinder supports an elongated guide channel 96 for the feed arm and protector pad. The guide channel thereby insures proper feeding of the protector pad from the hopper forwardly to the clips.

In the retracted position illustrated in full lines in FIG. 2 of the drawings, the clip head 90 is held in the downward position for receiving a protector pad between the clips 88, by means of the interengaging pin 98 and cam arm 100 mounted, respectively on the head 90 and guide channel 96. This position is maintained against the resilience of the coil spring 102 which encircles the pin 104 interconnecting the clip head 90 and support arm 92.

By movement of the carriage 40 toward the right in FIG. 2, as explained more fully hereinafter, the cam 100 is moved away from the pin 98, whereupon the head 90 rotates to the position illustrated in dash lines. This position of rotation is fixed by abutments properly located on the head 90 and support arm 92, and the extent of such rotation is 45°. It is to be noted in FIG. 2 that, in this position of rotation, the upper outboard protector pad 54 is oriented properly with relation to the upper outward edge of the package 20 to be strapped, but is yet not moved into close proximity thereto.

As explained hereinbefore, the upper clip head support arm 92 is mounted upon the cylinder 94. The arm extend through a vertically elongated slot 106 (FIG. 5 and 6) in the cylinder guide frame 108 which is mounted slidably upon the upper guide rod 36. The cylinder has an outer rectangular or other non-circular shape, as does the internal opening of the guide frame, to prevent rotation of the cylinder.

The piston 110 contained within the cylinder is connected to a piston rod 112 which extends upwardly through the cylinder and seats in a socket provided in the bracket 114 secured to the guide frame. Thus, upon admission of fluid pressure through the conduit 116 at the bottom of the cylinder, the piston remains stationary and the cylinder is driven downward. This downward movement of the piston results in simultaneous downward movement of the support arm 92, clip head 90 and protector pad 54, as explained more fully hereinafter.

Referring now to FIG. 5 of the drawings, it is to be noted that the carriage 40 is mounted slidably on the upper guide rod 36 by means of the spaced bearings 118 and 120 which confine the cylinder guide frame 108 therebetween. The assembly of carriage and hoppers is reciprocated along the guide rods by means of the attached piston rod 122 which is driven by means of the cooperating fluid cylinder 124 supported on the upper guide rod by means of the clamp 126. A coil spring 128 is interposed between the inner bearing 120 and the cylinder guide frame, to urge the latter resiliently toward the outer bearing 118. However, a stop 130 projecting from the vertical frame 26 abuts the cylinder guide frame when the carriage is in the fully retracted position illustrated, thereby maintaining the cylinder guide frame ad-

jacent the inner bearing **120**, against the compression of the spring **128**.

When the carriage is moved away from the outboard side of the strapping frame **18**, toward the inboard side thereof, by means of actuation of the cylinder **124** the carriage moves toward the right, carrying the hoppers with it. During a portion of this movement the cylinder guide frame **108** is maintained in abutment with the stop **130**, by means of the spring **128**. However, the remaining portion of movement of the carriage, with the outer bearing **118** abutting the cylinder guide frame **108**, moves the latter away from the stop **130** to the position illustrated in FIG. 6.

Movement of the carriage from the position illustrated in FIG. 5 to the position illustrated in FIG. 6, moves the lower outboard protector pad **54** toward the right in FIG. 2 into close proximity with the lower outboard edge of the package **20** to be strapped. This position is sensed by such means as engagement of the side wall of the package by the actuator arm **132** of microswitch **134** arranged in the circuit of an electrically actuated valve which controls fluid pressure to the cylinder **124**. Consequent movement of the cylinder **94** and guide frame **108** from the position illustrated in FIG. 5 to the position illustrated in FIG. 6 moves the upper outboard protector pad toward the right in FIG. 2 so that its vertical surface is almost aligned vertically above the vertical outboard side of the package. The cylinder **94** then is actuated to move the upper outboard protector pad downward to the package, as determined by engagement of the upper side of the package by the actuator arm **136** of microswitch **138** arranged in the circuit of an electrically actuated control valve for cylinder **94**. The pads **54** thus are brought to the positions shown in FIG. 3.

The foregoing sequence of operation of the mechanism associated with the lower and upper outboard protector pads also occurs simultaneously with the corresponding assemblies associated with the lower and upper inboard protector pads, whereby protector pads are positioned at the four edges of the package in the plane of the guide groove **24** for the strapping. Generally, the inboard bottom edge of the package is positioned against a guide bar located adjacent the inboard side of the guide frame **18**. Accordingly, the carriage **40** and pad support assemblies carried thereby need to be moved outwardly only a short distance. Therefore, the cylinder **124'** and piston rod **122'** may be much shorter than the outboard cylinder **124** and piston rod **122**.

When the pads are in position the strapping mechanism then is activated to feed the strapping loop about the package and to tighten and clamp the strapping in conventional manner.

As the strapping is tightened securely about the article, with the protector elements interposed therebetween, the strapping compresses the underlying portions of the projecting ribs. Accordingly, the adjacent portions of the ribs, not compressed, define margins which abut the side edges of the strapping and prevent lateral displacement thereof relative to the protector elements.

Following completion of the strapping operation, fluid cylinders **94**, **94'** are activated to effect upward retraction of the upper protector pad support mechanisms. As the clip supporting assembly for each protector pad is retracted from the pad, which now is secured by the tightened strapping, the resilient clips **88**, **88'** snap upwardly away from the engaging ribs **56**. Next, cylinders **124**, **124'** are activated to retract the carriages **40**, **40'**. This retraction results in returning pins **98**, **98'** into engagement with their respective cams **100** and **100'**, thereby automatically returning the upper clip heads **88**, **88'** to vertical position for receiving a second protector pad. Finally, cylinders **70**, **70'** are activated to retract the lower protector pad clip heads **62**, **62'** from the secured pads to the positions adjacent the hopper feeds where they are ready to receive a second pad.

The sequence may also include actuation of the feed cylinders **46**, **46'**, **80** and **80'** to eject another protector pad from the respective hoppers to the associated clip heads. Alternatively, this phase of operation may initiate the complete cycle rather than terminate the cycle, as will be apparent.

In FIG. 9 of the drawings there is illustrated a modified form of support head for a protector pad. In this embodiment the head **140** comprises a magnet having a V-shaped recess in its forward end, conforming to the outer surface of a V-shaped protector pad **142** made of magnetic material, such as steel. A plurality of the protector pads may be stacked in the hopper and fed therefrom as described hereinbefore. However, upon ejection from the hopper the pad is attracted by the magnet head and supported in proper position within the V-shaped recess. The pad then is conveyed to the appropriate edge of the package to be strapped, and after the strapping has been tightened the magnet head is retracted against the magnetic force of attraction of the secured pad.

In FIG. 10 the modified form of protector pad illustrated therein comprises a stip of heavy paper or other suitable material having an intermediate portion **144** forming a right angle V-shaped body. The outer end portions **146** are doubled back upon the body and terminate outwardly of the apex. In the case of paper, these doubled back end portions may be secured to the main body by glue **148** applied therebetween inwardly of the terminal ends of the outer sections. The supporting head **150** includes a pair of outwardly flared clips **152** which are adapted to be receive slidably in the space between the body **144** and the terminal portions of the outer sections **146**, as the pad is ejected from the supply hopper. After the pad is secured to the package by the encircling strapping, the head **150** is retracted simply by pulling the flared clips **152** away from the outer sections **146**.

The operation of the apparatus described hereinbefore is as follows: A package **20** to be strapped is fed into the opening in the strapping guide frame **18**, supported upon the spaced rolls **22**, and brought to rest at the position in which it is desired that a reinforcing strapping encircle the package. The operator then presses a start switch which initiates the following sequence: The feed cylinders **46**, **46'**, **80** and **80'** for all four edge protector pads **54** activate simultaneously to eject a pad into their associated supporting clip heads. It will be remembered that the upper pads are moved directly from the hoppers into the plane of strapping guide groove **24**. The feed cylinder **70** and **70'** for the lower outboard and inboard support assemblies then are activated to move the supported protector pads into the plane of the groove **24**. This movement simultaneously effects rotation of the supporting heads **62** and **62'** through 135° to the position illustrated in dash lines in FIG. 2, by virtue of the helical cam **78**. At this point all four protector pads are disposed in the plane of the strapping guide groove **24**, although they are not yet brought into close proximity with the edges of the package to be strapped.

The carriage drive cylinders **124** and **124'** then are activated to move the carriages **40** and **40'** toward each other. During an initial portion of this movement the support heads **90**, **90'** for the upper protector pads are caused to rotate through 45°, to the position illustrated in dash lines in FIG. 2. When the carriages are moved sufficiently inward so that the microswitch sensing arms **132** and **132'** engage the sidewalls of the package, carriage movement is stopped. In this position the lower protector pads are disposed adjacent the lower corners of the package, as illustrated in FIG. 3, but the upper pads are still disposed vertically above the package, at the elevation illustrated in FIG. 2. However, the vertical surfaces of the upper pads are disposed closely adjacent the vertical planes of the sidewalls of the package.

The drive cylinders **94**, **94'** for the upper support heads **90**, **90'** then are activated to move the upper protector pads downward to the upper corners of the package. Contact of the microswitch arms **136**, **136'** with the upper

surface of the package effects stopping of the drive cylinders and, preferably, effects activation of the strapping feed and clamp mechanism of the conventional strapping machine. The metal strapping, which may be a flat ribbon or a wire, then is looped and tightened about the package, with the protector pads interposed therebetween, and the ends of the strapping loop clamp together, in conventional manner.

Completion of the strapping operation then may initiate retracting of the support heads and carriage, in the reverse manner of the feeding procedure described hereinbefore.

It is evident from the foregoing that the present invention provides effective means for automatically positioning edge protector pads at the edges of a package in the plane of a strapping loop, preliminary to operation of a strapping machine. The pad positioning mechanism is readily adapted for mounting on a variety of types of automatic strapping machines. Positioning of the pads is accomplished with speed and precision, thereby substantially enhancing the utility of the strapping machine. Positioning of the pads also is accomplished automatically, regardless of the dimensions of the article to be strapped. The operation of the pad positioning mechanism may conveniently be integrated with the operation of the strapping machine, whereby to provide a complete automatic cycle of operation.

It will be apparent to those skilled in the art that various changes may be made in the details of construction described hereinbefore, without departing from the spirit of this invention and the scope of the appended claims.

Having now described my invention and the manner in which it may be used, what I claim as new and desire to secure by Letters Patent is:

1. For use with a package strapping machine wherein a length of strapping is caused to be looped about the package, apparatus for positioning an edge protector pad at an edge of a package to be looped by a strapping, comprising support means for releasably supporting an edge protector pad, means mounting the support means adjacent the strapping machine for movement between a retracted position away from the package to be strapped and in which retracted position the support means is disposed for receiving a pad for releasable support, and an extended position at an edge of the package in the plane of the strapping loop, a hopper for a plurality of pads, and feed means operable to move a pad from the hopper to the support means when the latter is in retracted position.

2. The apparatus of claim 1 including power means engaging the mounting means for moving the latter between said retracted and extended positions, and power control means movable with the support means and operable upon engagement with the package to be strapped to stop the extension of the support means when the pad is positioned at the edge of the package.

3. The apparatus of claim 1 wherein the support means comprises clip means adapted to releasably engage a pad.

4. The apparatus of claim 1 wherein the support means comprises magnet means adapted to support a magnetic pad.

5. For use with a package strapping machine wherein a length of strapping is caused to be looped about the package, apparatus for positioning an edge protector pad at longitudinally spaced edges of the package to be looped by a strapping, comprising support means for releasably supporting an edge protector pad for each edge, means mounting one of the support means adjacent the strapping machine for movement between a retracted position away from the package to be strapped and in which retracted position the support means is disposed for receiving a pad for releasable support, and an extended position at one of the edges of the package in the plane of the strapping loop, means mounting the other support means for movement with the first named support means and for movement between a retracted position away from the package to be strapped and in which retracted position the support means is disposed for receiving a pad for releasable support, and an extended position at the other edge of the package in the plane of the strapping loop, a hopper associated with each support means for storing a plurality of pads, and feed means associated with each hopper and operable to move a pad from the hopper to the support means when the latter is in retracted position.

6. The apparatus of claim 5 including power means engaging each mounting means for moving the latter between said retracted and extended positions, and power control means movable with each support means and operable upon engagement with the package to be strapped to stop the extension of the associated support means when the pad is positioned at the edge of the package.

7. For use with a package strapping machine wherein a length of strapping is caused to be looped about the package, apparatus for positioning an edge protector pad at each edge of the package to be looped by a strapping, comprising support means for releasably supporting an edge protector pad for each edge, means mounting each support means adjacent the strapping machine for movement between a retracted position away from the package to be strapped and in which retracted position the support means is disposed for receiving a pad for releasable support, and an extended position at an edge of the package in the plane of the strapping loop, power means engaging each mounting means for moving the latter between said retracted and extended positions, power control means movable with each support means and operable upon engagement with the package to be strapped to stop the extension of the associated support means when the pad is positioned at the edge of the package, a hopper associated with each support means for storing a plurality of pads, and feed means associated with each hopper and operable to move a pad from the hopper to the support means when the latter is in retracted position.

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