

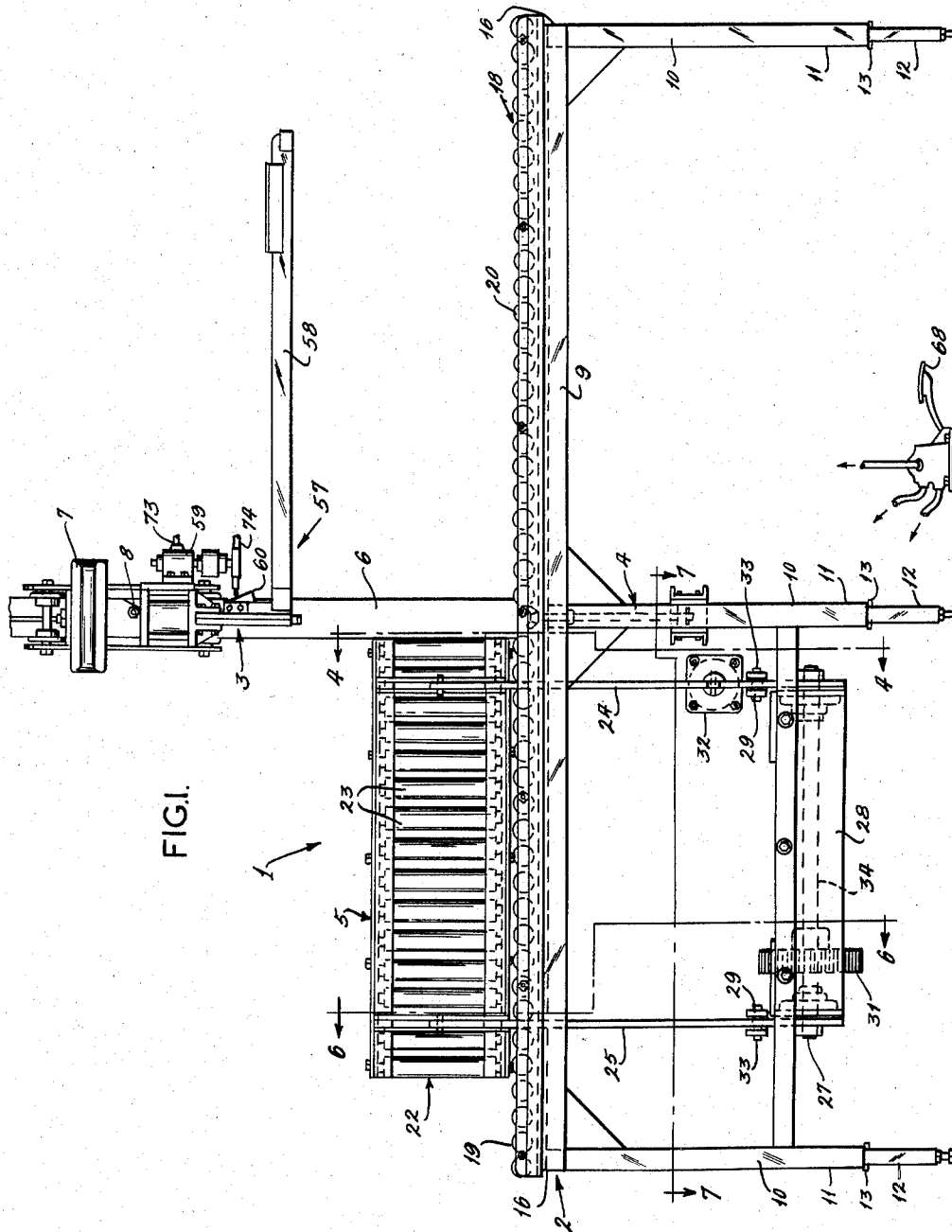
July 14, 1959

W. SCHAFFROTH
TABLE STAPLING MACHINE

2,894,262

Filed March 26, 1956

6 Sheets-Sheet 1



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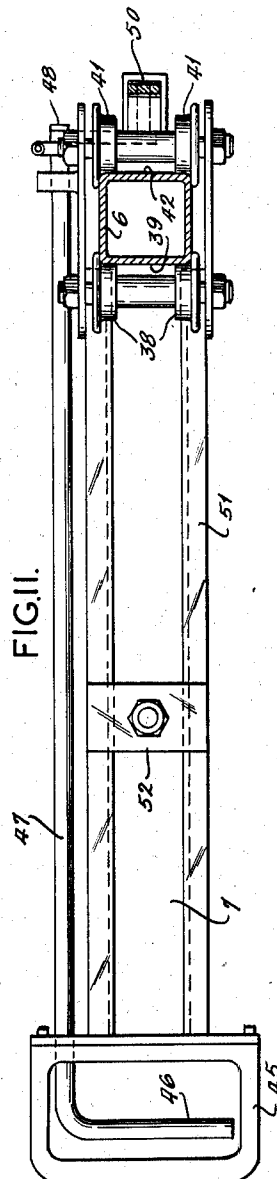
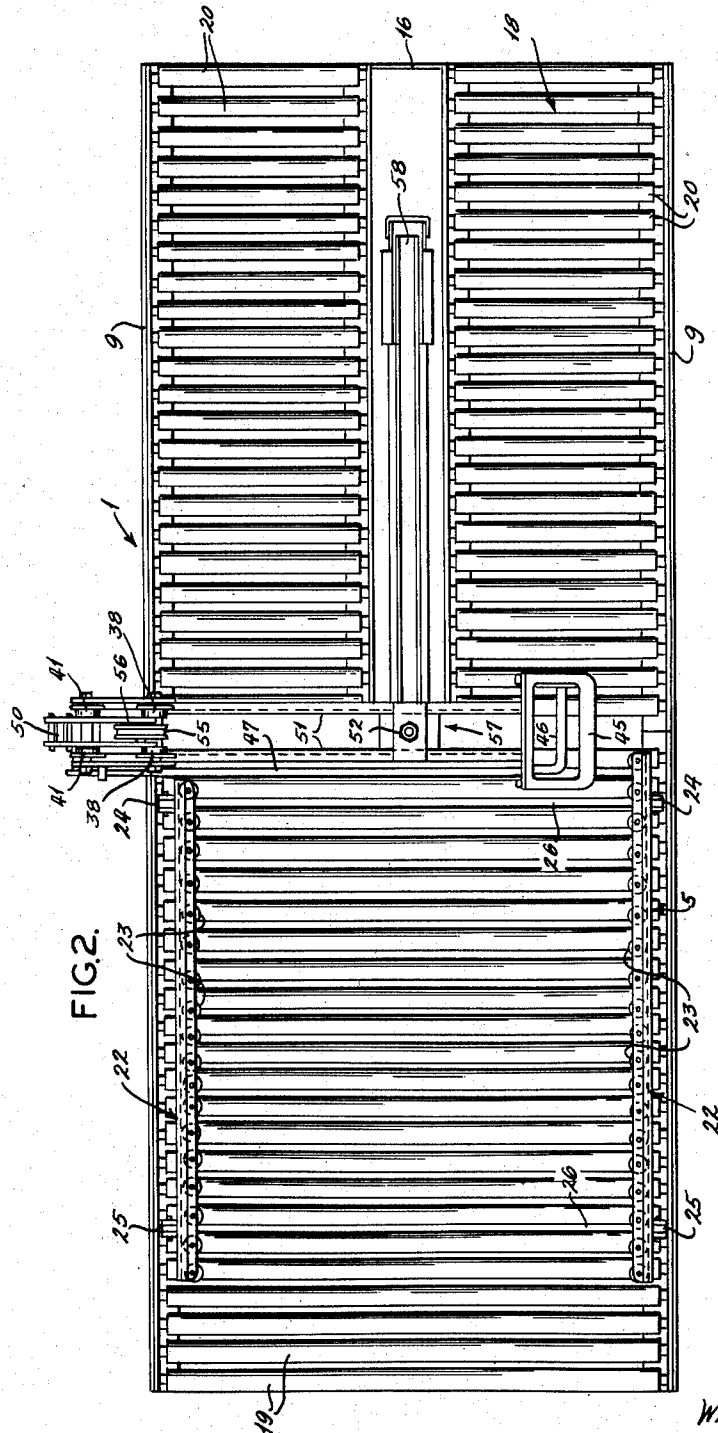
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6 Sheets-Sheet 2



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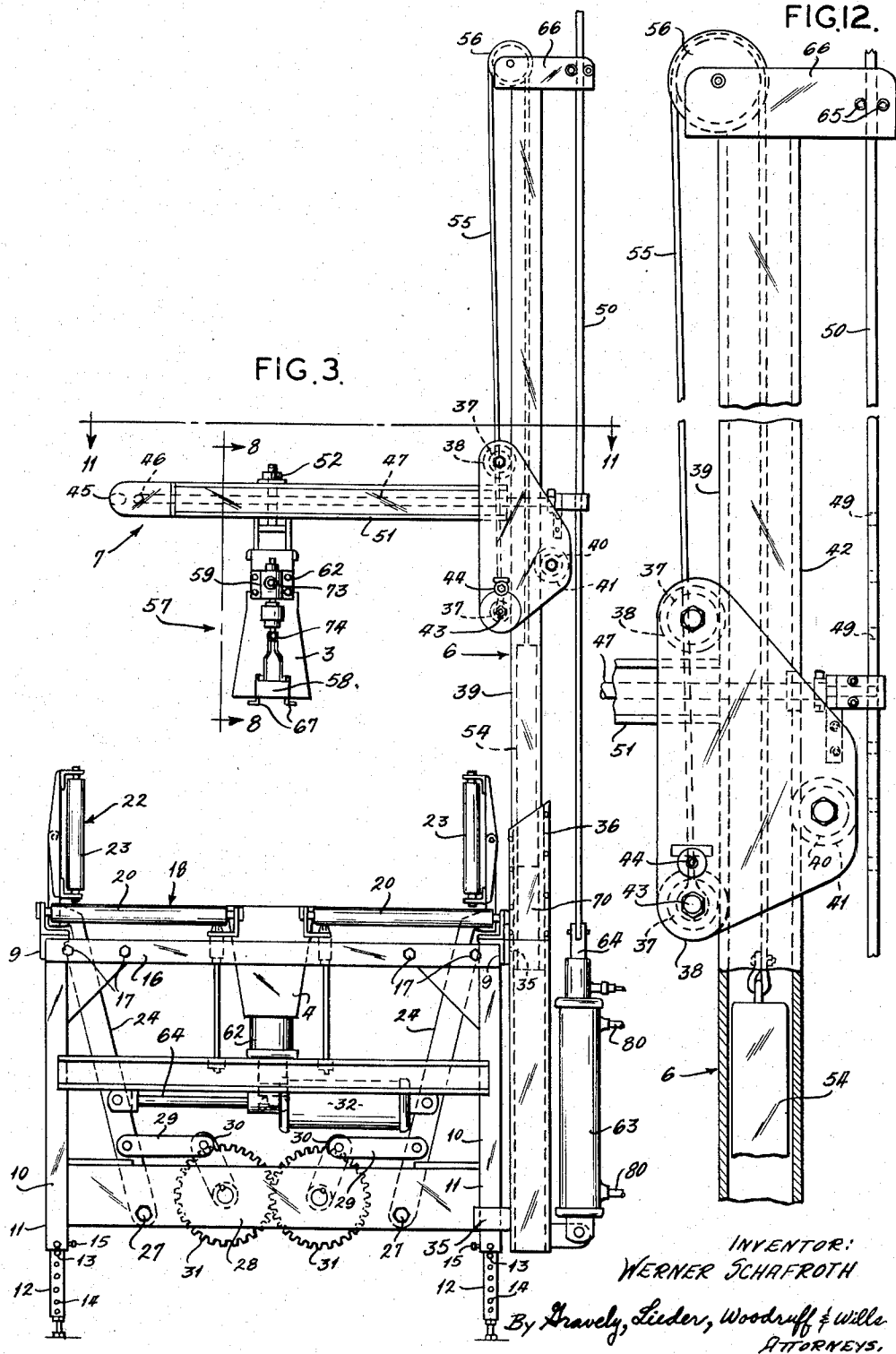
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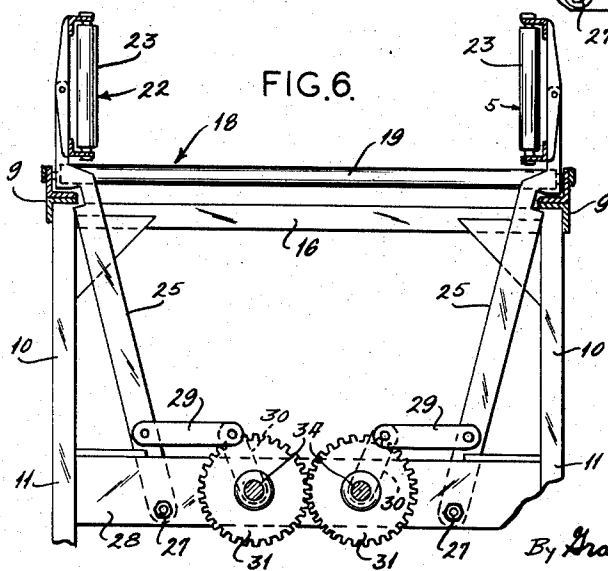
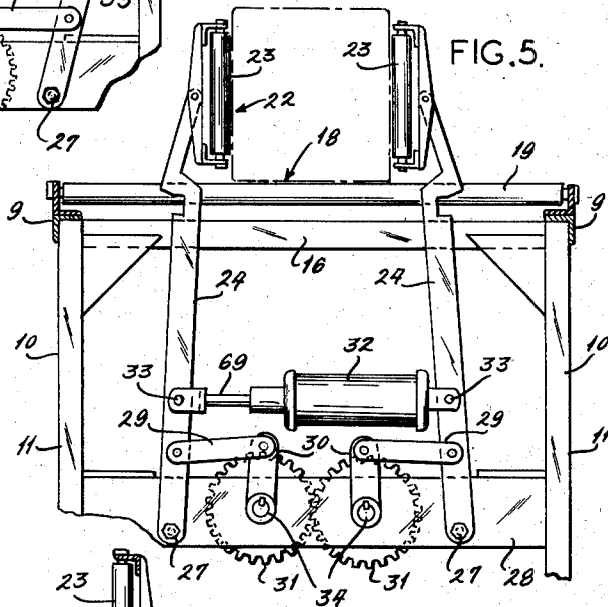
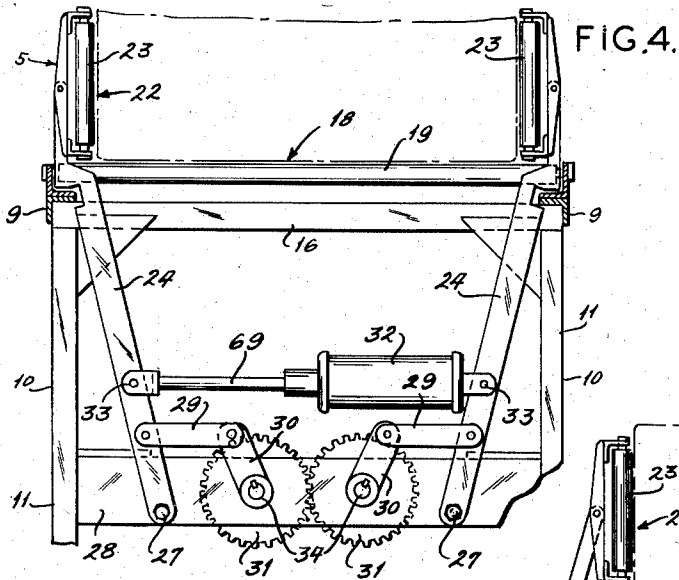
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TABLE STAPLING MACHINE

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6 Sheets-Sheet 4



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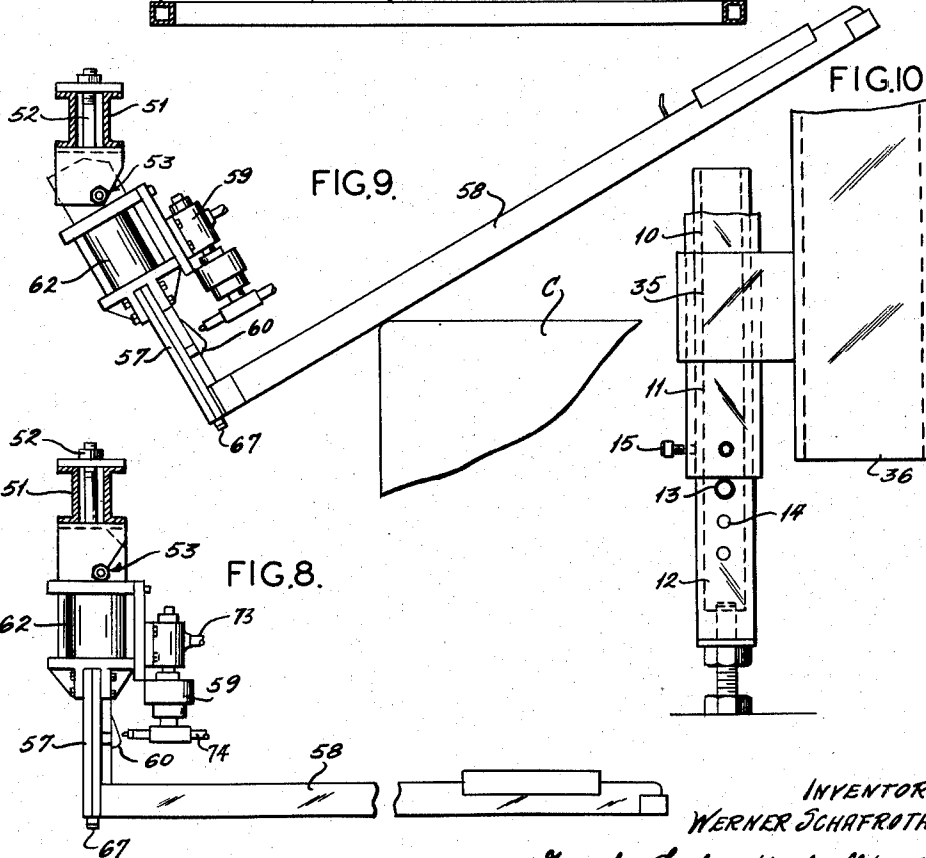
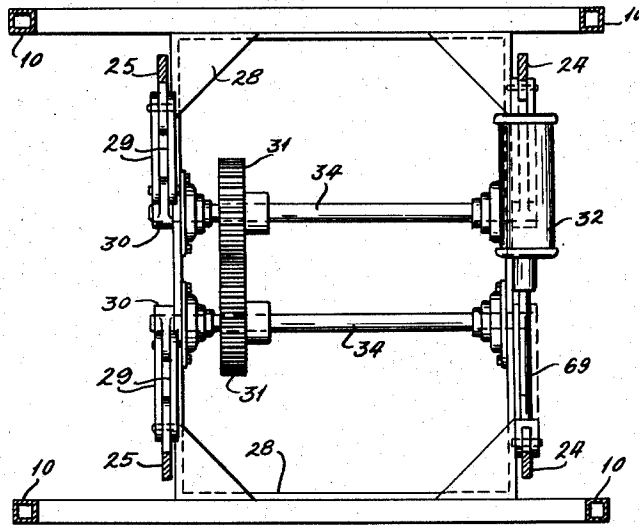
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6 Sheets-Sheet 5

FIG. 7.



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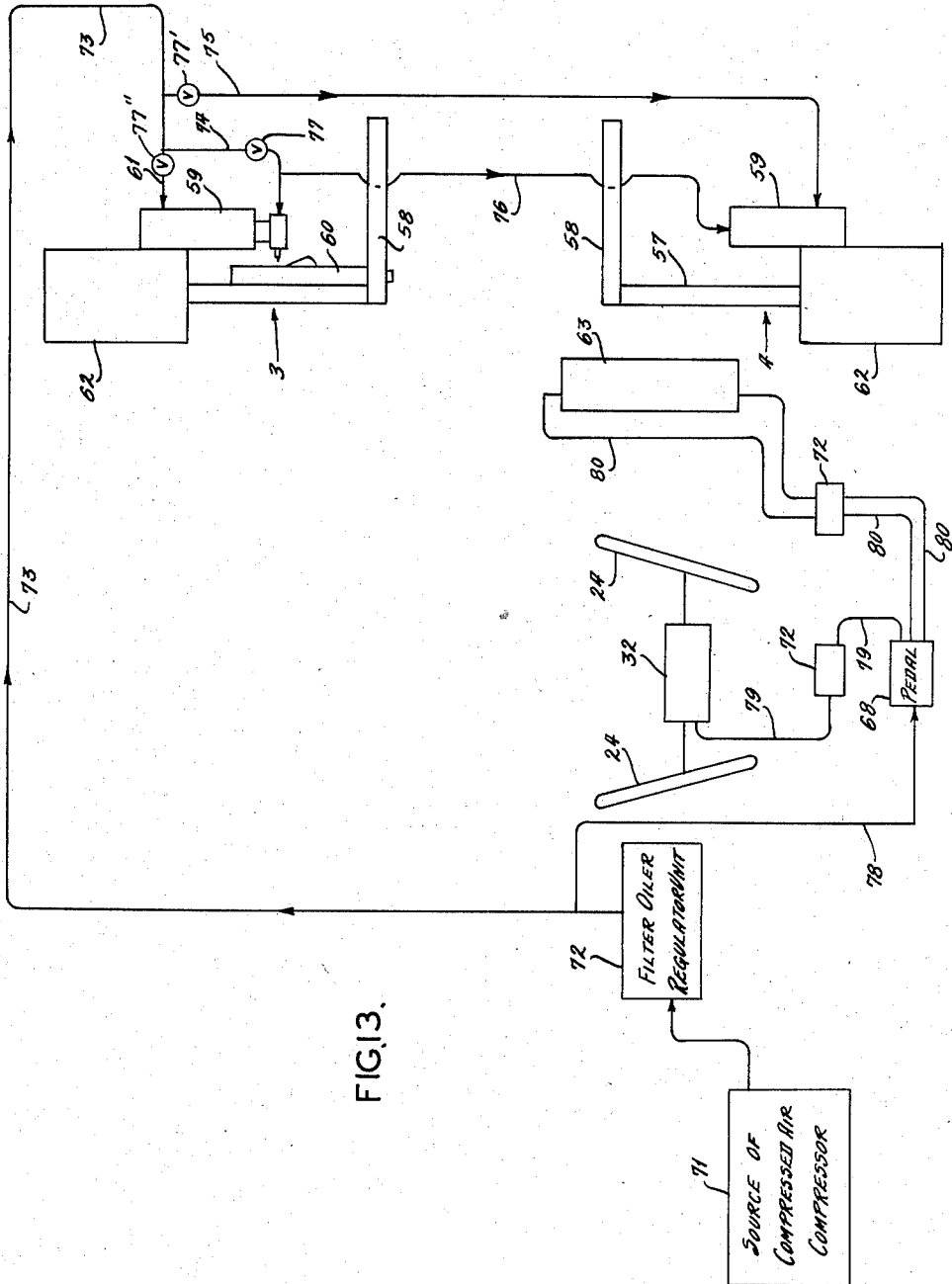
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TABLE STAPLING MACHINE

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6 Sheets-Sheet 6



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2,894,262

TABLE STAPLING MACHINE

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Application March 26, 1956, Serial No. 573,798

2 Claims. (Cl. 1—13)

This invention relates generally to table stapling machines having one or more stapling heads therein and more particularly to a table stapling machine which is reversible, fully pneumatically operated, whose height can be varied, which can be knocked-down, which has a safety hinge for the movable stapling head, and which has automatic carton centering means.

Staples are commonly used for closing cartons or master shipping containers which are filled or loaded with goods. The stapling machines which are used are preferably of the retractable anvil type wherein anvils are projected from the bottom edge of the stapling machine itself and penetrate the material to be stapled so that the staple is clinched from the same side from which it is driven. Stapling machines of this type are shown in the Taylor and Sharpnack Patent No. 2,012,027, dated August 20, 1935, and in the Schafroth Patent No. 2,740,119, dated April 3, 1956, and others.

For production purposes, these stapling machines are frequently mounted in tables or other suitable supporting structures and are power operated. The stapling machines or so-called stapling heads are mounted in the supporting structure so that the covers, the bottoms, or the side or end walls of a carton, or some combination thereof, can be stapled quickly and conveniently. Since the stapling machines are usually placed at the end of a conveyor line, they are usually power driven so that an operator need only actuate certain controls in order to perform the stapling operation after the carton has been properly positioned or oriented in the machine.

It is common practice to use a source of compressed air which is directed into a power air cylinder on the stapling head for operating the staple driving blade and linkage which moves the retractable anvils to effect the clinching of a staple. In the past, it has been common practice to move the carton centering means electrically and to move the movable stapling head either manually or electrically. In many installations, the bulk or mass of the stapling head, which includes the staple mechanism and the air cylinder and the control means, was so great that it was impossible or impractical to move the movable stapling head manually toward the carton to be closed, especially since the control means thereon sometimes consisted of relatively heavy electrical equipment. Moving the stapling head electrically by means of motors added still more weight to the machine, introduced further problems, and greatly increased the cost of the machine.

Present commercial table stapling machines having automatic carton centering means are bulky, heavy and contain much electrical equipment for operation. These machines are expensive, difficult to transport, and rigid so that they must be designed for a particular purpose and location within a plant. Thus, special mountings of a permanent nature are usually required to support these heavy machines. If a machine is needed at some different location within the plant, it sometimes becomes desirable to feed the machine from the right side instead of from the left side, or vice-versa. On some occasions this cannot

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be done simply by rotating the machine horizontally 180° since a wall or other equipment might prevent an operator from standing on one particular side of a machine.

One of the principal objects of the invention is to provide a table stapling machine which is reversible so that it can be fed from the left or from the right if preferred. Another object is to provide a machine which is fully pneumatically operated by the same source of power which actuates the stapling mechanism and which requires no electrical equipment whatever. Another object of the present invention is to provide a power driven stapling machine having a light movable stapling head which is hinged to prevent injury should a portion of the head, usually the magazine, contact an object above the level of the carton to be stapled.

Another object is to use compressed air to quickly and positively orient a carton in the machine, move the stapling head into contacting relation with a carton to be stapled, and then operate the stapling mechanism. Another object is to provide a lightweight table stapling machine having detachable side and end units with adjustable legs. Still another object is to provide a lightweight movable stapling head mounted on a mast which can be secured to either side of the machine so that the feed can be reversed.

These and other objects and advantages will become apparent hereinafter.

The invention is embodied in a stapling machine having means for orienting a carton on the work surface thereof, a mast removably secured to said machine, and an air actuated and operated stapling head movably connected to said mast.

The invention also consists in the parts and in the arrangements and combination of parts hereinafter described and claimed. In the accompanying drawings which form part of this specification and wherein like numerals and letters refer to like parts wherever they occur;

Fig. 1 is a side elevational view of a table stapling machine embodying the present invention,

Fig. 2 is a top plan view of said machine,

Fig. 3 is an end elevational view of said machine,

Fig. 4 is a vertical cross sectional view taken along the lines 4—4 of Fig. 1 showing the carton centering means,

Fig. 5 is a vertical cross sectional view along the line 4—4 of Fig. 1 showing the carton contact members in their innermost or box centering position,

Fig. 6 is a vertical cross sectional view taken along the line 6—6 of Fig. 1,

Fig. 7 is a horizontal cross sectional view taken along the line 7—7 of Fig. 1,

Fig. 8 is an enlarged fragmentary sectional view taken along the line 8—8 of Fig. 7 showing the support bracket and stapling head with the safety hinge therebetween.

Fig. 9 is an enlarged fragmentary view of said safety hinge showing the stapling head slightly rotated upwardly,

Fig. 10 is an enlarged fragmentary view of one of the adjustable legs of the table,

Fig. 11 is a top plan view of the support bracket,

Fig. 12 is an enlarged fragmentary side elevational view of the support bracket mounted on the mast, and

Fig. 13 is a diagrammatic view of one pneumatic system for operating the various air cylinders and air valves of the machine.

Referring now to the drawings in detail, it will be seen that the embodiment of the invention which has been illustrated comprises a table stapling machine 1 having a frame 2 supporting one or more stapling heads 3 and 4, an automatic carton orienting and centering means 5, an upstanding tower or mast 6 removably secured to one side of said frame 2, a carriage 7 slidably mounted on said mast 6,

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and a safety hinge 8 between said carriage 7 and the upper stapling head 3.

The frame 2 comprises two side units 9 each having three supporting legs 10 which can be adjusted to an appropriate height. Each leg 10 comprises an upper leg portion 11 which telescopes over a lower leg portion 12. A pin 13 is inserted into one of a series of vertically spaced holes 14 in the lower leg portion 12. A screw 15 through the upper leg portion 11 secures the two leg portions together and prevents the lower leg portion 12 from falling out of the upper leg portion 11 if the frame 2 is lifted. Separate end units 16 are fastened to the side units 9 by bolts 17 or the like so that the frame 2 can be knocked down for shipment or storage. The frame 2 contains a work surface 18 which comprises a plurality of spaced transverse rollers 19 and 20 extending between said side units 9. The rollers 19 adjacent to the carton centering means 5 extend completely across the frame 2. The rollers 20 at the opposite half portion of the machine are divided so as to accommodate the magazine of the inverted lower stapling head 4 which drives staples into the bottom of a carton.

The carton centering means 5 comprises two longitudinal contact members 22 normally positioned slightly inwardly of the side units 9. The contact members 22 preferably are provided with a plurality of rollers 23. Each contact member 22 has two downwardly extending arms 24 and 25 pivotally connected thereto, said arms extending through the transverse openings 26 in the work surface 18 between said rollers 19. The lower end of each arm 24 and 25 is pivotally mounted on a pin 27 which is fixed on a sub-frame 28. Each of the arms 24 and 25 has an inwardly extending substantially horizontal bar 29 having a driving link 30 thereon pivotally secured to a gear 31 or gear segment. One pair of opposing arms 24 has an air cylinder 32 mounted horizontally therebetween on pins 33. The gears 31 have shafts 34 mounted in the centering means sub-frame 28 which contains the pins 27. Another set of gears 31 are mounted on said shafts 34 and are operatively connected to the arms 25 by means of bars 29 and driving links 30.

An upstanding tubular mast 6 is removably secured to the center leg of one side unit 9 by means of brackets and bolts 35, or if preferred by means of a socket 36 bolted to said leg and/or bracketed to said leg. A carriage 7 is slidably mounted on said mast 6 so that it can be moved vertically with ease. The carriage 7 is provided with bearings 37 and rollers 38 which roll along the vertical inner surface 39 of said mast 6 and a bearing 40 and roller 41 which rolls along the outer surface 42 of said mast 6. One set of bearings 37 is mounted on a shaft 43 having an eccentric cam adjustment 44 to move the roller 38 close to the mast 6 as the mast or rollers wear in order to prevent wobbling between the carriage 7 and the mast 6. The carriage 7 is provided with a handle 45 having a trigger 46 therein which if pulled allows the carriage 7 to be moved vertically on the mast 6 for initial setting or adjustment purposes. The trigger 46 comprises a small shaft or bar 47 having an end 48 which is biased into one of a series of vertically spaced holes 49 in a vertically extending bar 50 mounted parallel to said mast 6. The carriage 7 contains a support bracket 51 having lateral adjusting means 52 therein for properly positioning the upper stapling head 3 which is hingedly secured thereto by a safety hinge 53 which is in fact a bolt. The weight of the carriage 7 and upper stapling head 3 is counterbalanced by a weight 54 movable within the hollow mast 6 and connected to the carriage 7 by means of a cable 55 which extends over a pulley 56.

The upper stapling head 3 includes a vertical stapling mechanism 57 with a horizontal magazine 58 rigidly secured thereto. An air valve 59, which is

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actuated by a trip mechanism 60, allows compressed air from a conduit 73 to enter an air cylinder 62 to actuate the stapling mechanism 57 to drive a staple. This stapling head 3 and its component parts are more fully described in my co-pending application entitled "Air Operated Control Means for Stapling Machines" executed and filed concurrently herewith and given Ser. No. 573,796.

An air cylinder 63 is mounted on the lower portion of said mast 6 with its piston rod 64 extending upwardly therefrom and connected to the bar 50 whose upper portion is slidably mounted between guide means 65 in the upper plates 66 which rotatably support said pulley 56.

In operation, the table stapling machine 1 shown in Figs. 1-3 is preferably placed at the end of a conveyor line in a plant or factory so that filled or loaded cartons are received from the left and are directed onto the work surface 18 between the carton centering means 5 whose contact members 22 are normally in their spread position as shown in Figs. 2 and 4. Prior to stapling any carton, the carton centering means 5 and the carriage 7 are adjusted so as to accommodate the size of carton which is to be stapled in great numbers. The carriage 7 can be moved vertically on the mast 6 so as to be able to staple cartons from 2½ inches in height to 40 inches in height. Preferably, the normal inoperative position of the carriage 7 should be such that the feet 67 of the trip mechanism 60 are approximately 2 to 4 inches above the carton to be stapled. The carriage 7 is adjusted by squeezing the trigger 46 in the handle 45 to disengage the end 48 of the shaft 47 from the hole 49 in the bar 50. The counterbalanced carriage 7 can then be moved vertically to the desired height. The trigger 46 is then released thereby allowing the end 47 to engage a different hole 49. Of course, there must be a source of compressed air to the machine, preferably about sixty pounds per square inch, and the individual stapling heads 3 and 4 must be properly adjusted.

When a carton moves onto the work surface 18 between the carton contact members 22, the operator depresses the pedal 68 which forces contact members 22 inwardly toward each other an equal amount thereby centering the carton on the work surface 18. Depressing the pedal 68 to its intermediate position causes air to be forced into the horizontal air cylinder 32 which has a piston therein which is moved so as to project the piston rod 69 therefrom to spread one pair of arms 24. The pivoting movement of the arms 24 moves the bars 29 and links 30 connected thereto to rotate the gears 31 which insure equal movement of the arms 24. The gears 31 in turn rotate the shafts 34 which in turn rotate a second pair of gears 31 which move the links 30 and bars 29 of the other pair of arms 25. Thus, the linkage is such that movement of the piston in the air cylinder 32 causes equal movement in each of the four arms 24 and 25 thereby causing the contact members 22 to move an equal distance inwardly to orient and center the carton to be stapled.

The operator moves the carton rightwardly between the upper and lower stapling heads 3 and 4 and depresses the pedal 68 to its lowest position thereby allowing air to be directed to the upper end of the carriage air cylinder or actuator 63 which has a piston therein with a piston rod 64 and bar 50 thereon whose movement causes a similar downward movement of the carriage 7. The carriage 7 moves downwardly until the bottom edge of this stapling mechanism 57 is in contacting relation with the carton. In so doing, the trip mechanism 60 automatically actuates the air valves 59 which allows air to be directed into the air cylinders 62 mounted on the upper and lower stapling heads 3 and 4. The operation of the air control means for each stapling head is described in my co-pending application entitled "Air Operated Control Means for Stapling Machines" executed and filed con-

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currently herewith and given Ser. No. 573,796. Thus, a staple is driven into the cover and bottom of the carton simultaneously. When the pedal 68 is released, air is directed into the bottom of the actuator 63 to return the carriage 7 to its upper position approximately three or four inches above the carton.

When cartons of different heights are stapled, the operator sometimes neglects to move the previous taller carton rightwardly beyond the end of the upper magazine 58. Sometimes, the operator might inadvertently place his hand on a carton which has already been stapled. In either event, the downward movement of the carriage will either damage the tall carton C, damage the magazine 58, or cause injury to the operator. To prevent this, a safety hinge 53 is provided between the support bracket 51 and the upper stapling head 3 so that if the magazine 58 contacts any foreign object C it will be free to rotate upwardly as shown in Fig. 9 to prevent damage or injury. The foreign object may then be removed and the upper stapling head 3 automatically returns to its position as shown in Figs. 1 and 8.

A rigid machine of the type shown in Fig. 1 is extremely difficult to ship. By providing detachable end units 16, the frame 2 of the foregoing machine can be easily knocked down into separate side units 9, end units 16, work surface 18, and box centering unit 5. Also, the mast 6 can be detached from the side unit 9 and shipped in contacting adjacent relation to said knocked down units. Since the mast 6 is usually taller than the length of the machine, it is desirable to divide the mast at a point adjacent to the work surface 18 so that a longer package is not required. To accomplish this, the mast 6 is provided with a lower portion 70 which fits into the socket 36 on the frame 2.

The machine is provided with adjustable legs to vary the height of the work surface. This is important since a plant might have several different conveyor lines of different heights. The present machine can be used at the end of any of such conveyor lines and can be fed either from the right or from the left simply by rotating the work surface 180 degrees. However, such rotation places the operator on the opposite side of the machine and in some plants this is not possible because of an adjacent wall or other equipment. In that event, the work surface 18 can be placed with its box centering means 5 adjacent to the end of the conveyor and the mast 6 can be secured to the side unit 9 of the machine which is not accessible to the operator. Thus, this machine is reversible and versatile, is light in weight, and requires no electrical connections for operating either the box centering means, the movable carriage, or the control means for the individual stapling heads.

Fig. 13 shows a diagrammatic view of one pneumatic system for operating the various air cylinders of the table stapling machine previously described. Referring to Fig. 13, a compressor 71 supplies compressed air directly or indirectly to one or more filter, oiler, and regulator units 72 which are usually mounted on the stapling machine itself, either on the centering means subframe 28 or on a horizontal bar connected between two adjacent legs 10 so that the dials, filters, and oilers are readily visible to the operator. Compressed air at all times is fed to the air valve 59 of the upper or movable stapling head 3 through a conduit 73 having a short conduit 74 extending to the opposite side of said air valve 59 so that the same pressure is directed into each end of the air valve 59. A supply or working conduit 75 is connected to the conduit 73 so that the same air pressure is directed to the corresponding places of the air valves 59 on both stapling heads 3 and 4. Another conduit or control line 76 extends from the conduit 74 into the corresponding portion of the air valve 59 of the lower or fixed stapling head 4. If desired, valves 77, 77', and 77'' may be provided in the lines 74, 75 and 61 respectively to render the lower fixed stapling head 4 inoperative, or if preferred,

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the upper movable stapling head 3 inoperative. The valve 77 is a needle valve and the valves 77' and 77'' are manual shut off valves to render the fixed head 4 or movable head 3 inoperative.

Thus, it is apparent that only one trip mechanism 60 is necessary in the air system of the stapling heads since lines 75 and 76 are directed into the corresponding places of the air valve of the lower stapling head so as to actuate the remote stapling head 4 when the stapling head 3 is actuated upon actuation of said trip mechanism 60.

A line 78 supplies the foot pedal valve 68 with compressed air which originates at the compressor 71. Before entering the various air cylinders and valves, the air is passed through a filter, oiler and regulator unit such as indicated at 72. Several such units 72 which oil and filter the air in the system may be provided to reduce the moisture content of the air and lubricate the parts. The pedal 68 has a line 79 connected to the air cylinder 32 which actuates the cylinder 32. The pedal 68 also has lines 80 connected to the top and bottom of the air cylinder 63 mounted on the mast 6 for lowering and raising the carriage 7. Preferably, the lines 79 and/or 80 may be provided with one or more separate suitable filter, oiler, and regulator units 72 as shown.

The system shown in Fig. 13 is representative of one system which can be used. As shown, the centering means 5 is actuated by the pedal 68. If desired, a separate valve can be mounted on the side unit 9 adjacent to the operator so that the operator can operate said valve with his leg or hand to actuate the centering means 5. This valve, not shown, may be of the "normally off" type wherein the operator must depress said valve and keep said valve depressed in order to keep the contact members 22 together. With such a valve, the contact members 22 resume their normal or spread position upon release of said valve. If preferred, the valve may be of the type wherein the contact members 22 remain either in their inner or spread position depending upon the position which the operator sets the valve.

If desired, the foot or hand operated valve for controlling the centering means 5 can be eliminated and suitable valve means can be positioned between the contact members 22 so as to extend upwardly between two adjacent rollers 19 so that the carton itself when passing over said valve actuates the carton centering means 5. The carton depresses said valve thereby moving the contact members 22 inwardly as shown in Fig. 5 where said members remain until said carton has been stapled and moves rightwardly thereby allowing said valve to be released and causing said contact members 22 to assume their spread position shown in Fig. 4.

It is apparent from the foregoing that the table stapling machine described herein is fully pneumatically operated and requires no electrical means thereon whatever.

This invention is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of the disclosure, which do not constitute departures from the spirit and scope of the invention.

What I claim is:

1. A table stapling machine comprising a frame having detachable side and end units, a work surface supported by said units for supporting a carton to be stapled, means for orienting a carton on said work surface, an upstanding mast removably connected to one side unit of said frame and adapted to be secured to the other side unit if desired, a vertically movable bracket mounted on said mast above said work surface, a stapling head hingedly connected to said bracket, said stapling head having a stapling mechanism therein which is actuated by an air cylinder, an air valve connected to said air cylinder for controlling same, said stapling head having a trip mechanism thereon for actuating said air valve, air cylinders for actuating said carton orienting means and the movement of said bracket on said mast, and means

for supplying air under pressure to each of said air cylinders and air valve.

2. A table stapling machine having two stapling heads therein, said machine having side units with legs thereon adjustable in height, end units detachably connected to said side units, a work surface supported by said units for receiving and supporting a carton to be stapled, means at one end of said work surface for orienting and centering a carton on said work surface between said side units, said work surface having a plurality of rollers therein, one of said stapling heads fixedly mounted in said frame and adapted to staple the bottom of said carton, a vertically extending mast detachably secured to one leg of one side unit and adapted to be secured to the opposite leg of the other side unit if desired, a bracket movably mounted on said mast, said bracket extending over said work surface and movable toward and away from said work surface, a stapling head hingedly connected to said bracket directly above said fixedly mounting stapling head, a counterbalance movably mounted on said mast to compensate for the weight of said bracket and stapling head thereon, said hingedly connected stapling head hav-

ing a trip mechanism and air valve for controlling the operation of same, air operated means for operating said carton centering means and moving said bracket and stapling head thereon toward said work surface, said air operating means controlled by an operator controlled valve, said stapling heads being operated by air upon actuation of said trip mechanism when said movable head contacts the carton to be stapled.

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