

FIG. 1

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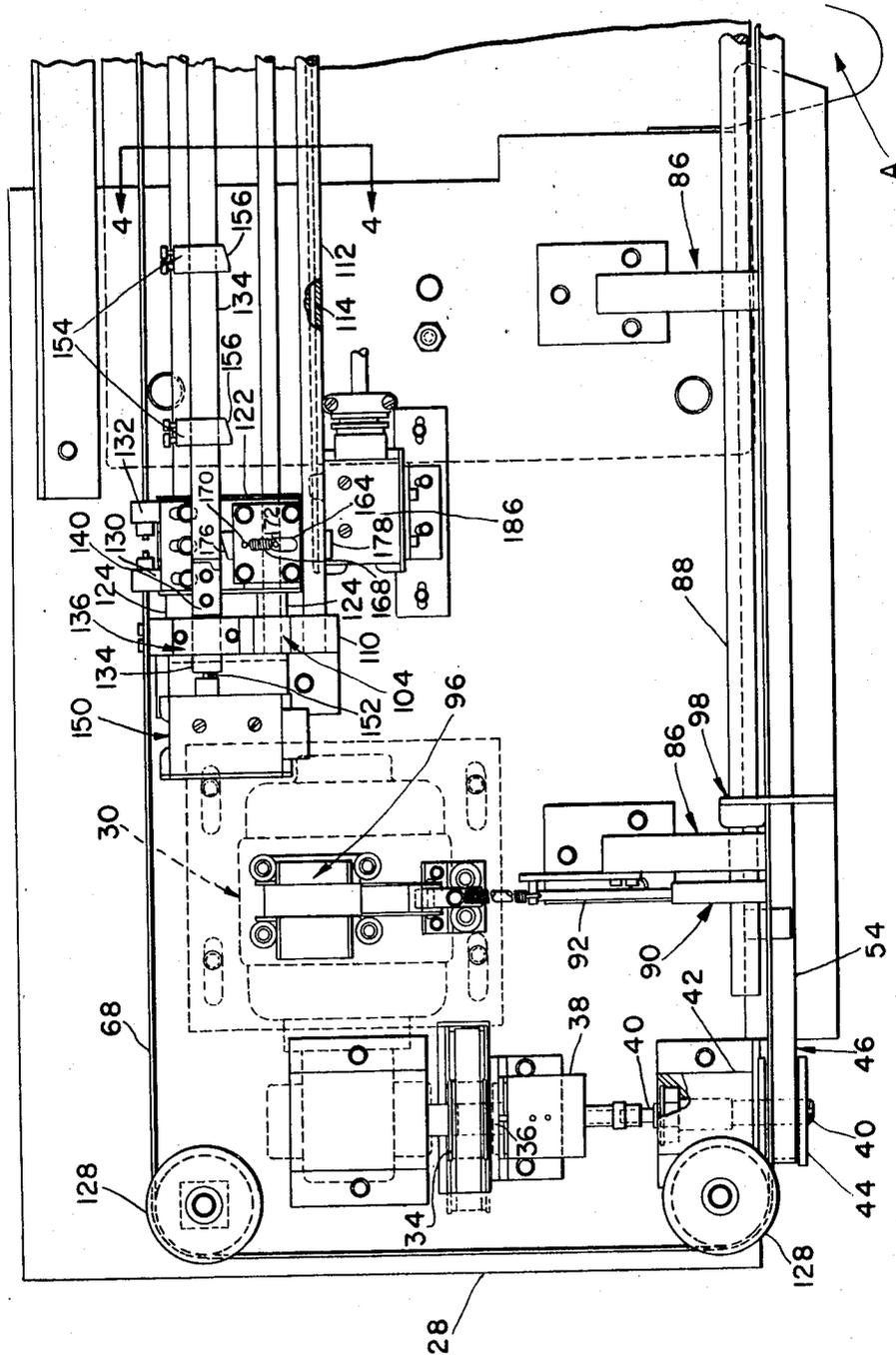


FIG. 2A

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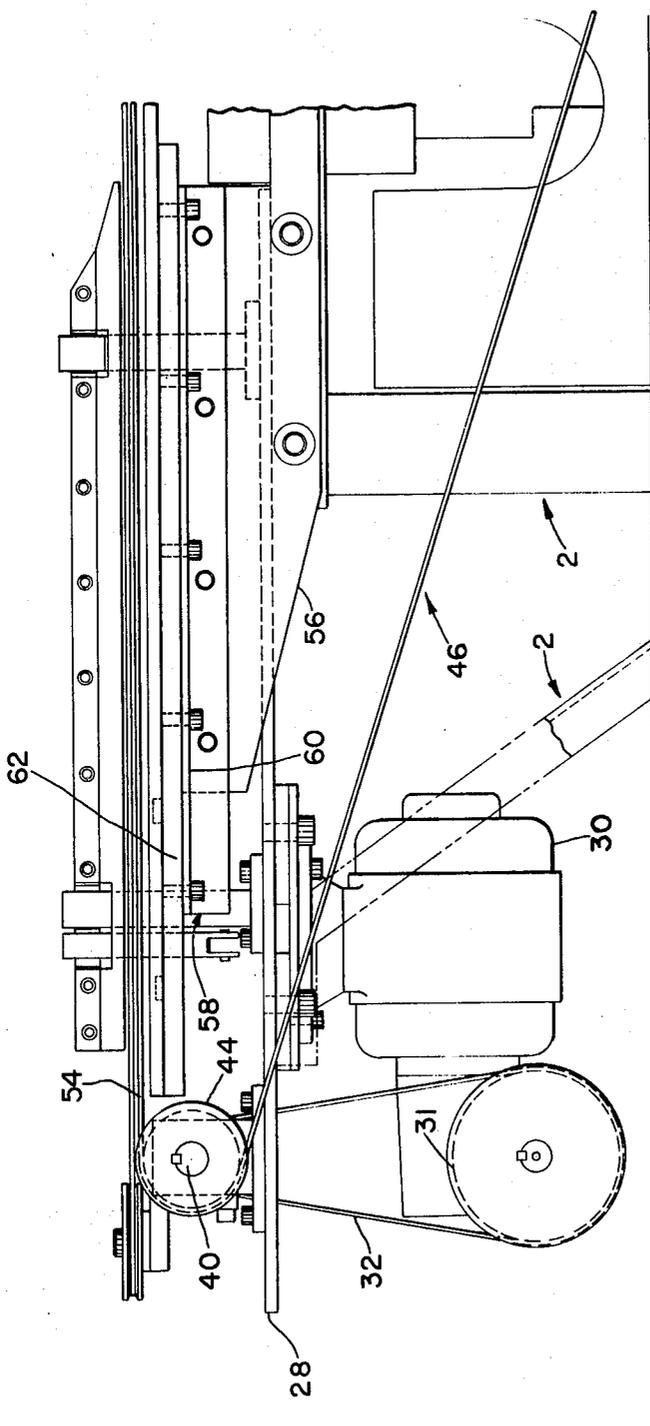


FIG. 3A

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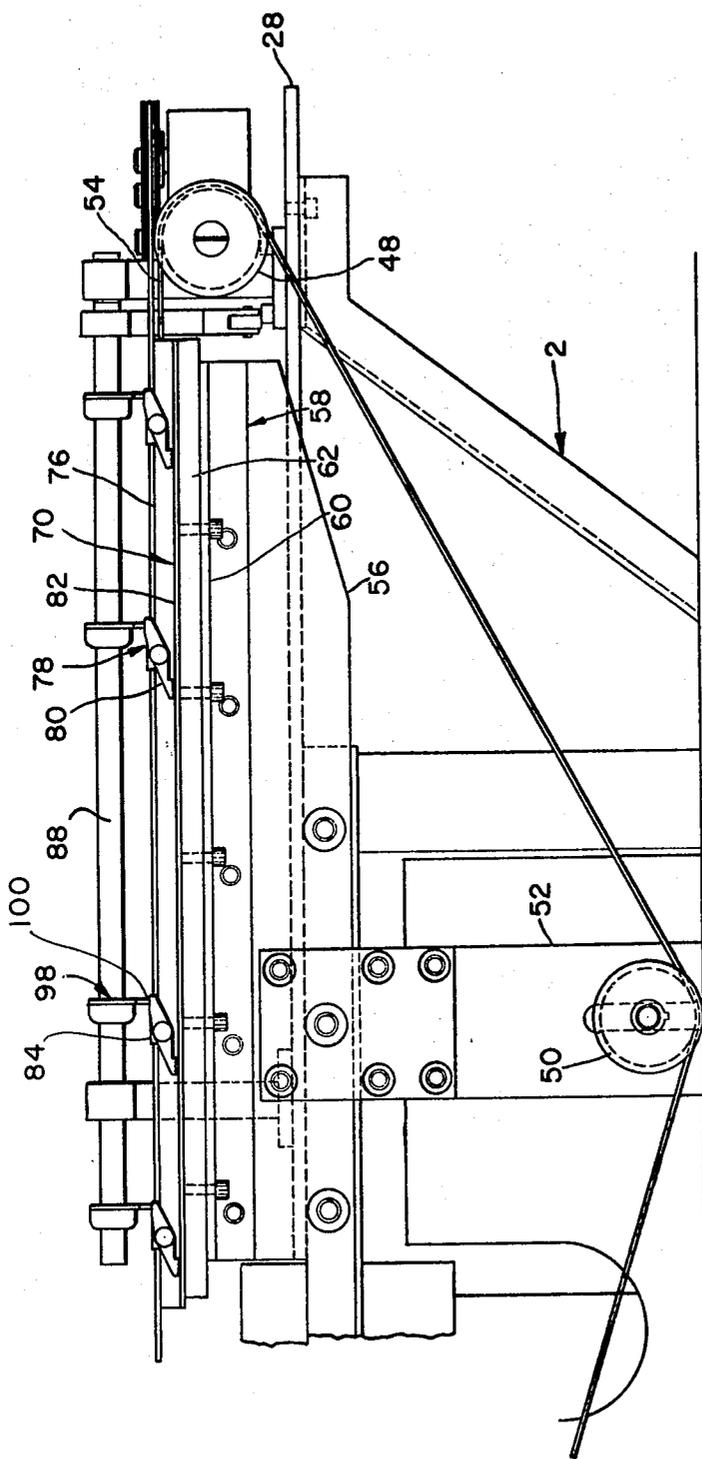


FIG. 3B

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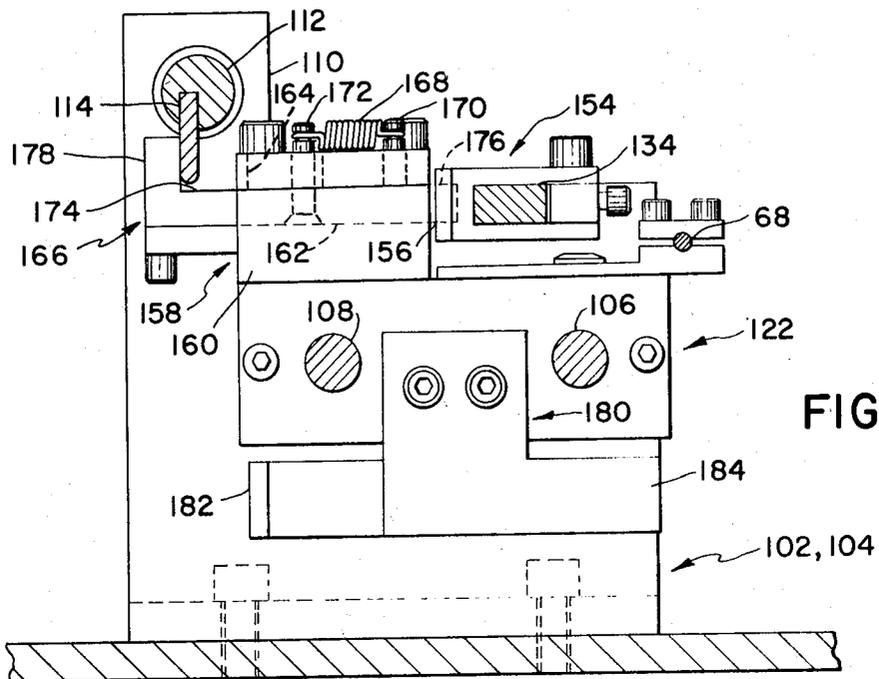


FIG. 4

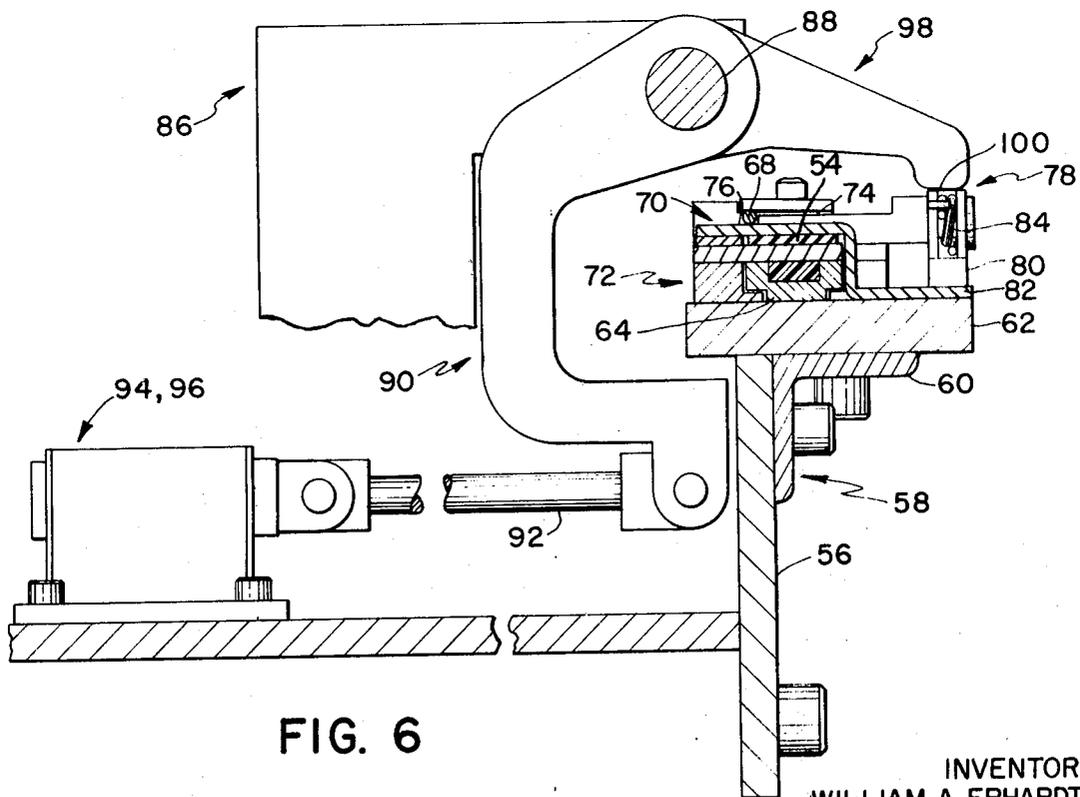


FIG. 6

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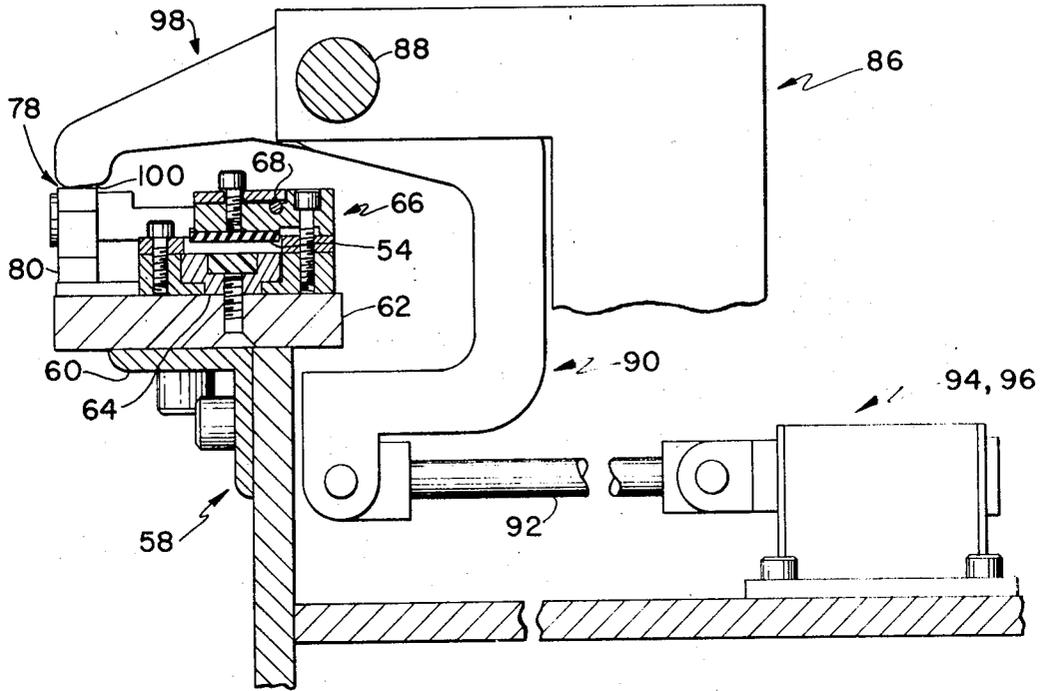


FIG. 5

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FASTENER-ATTACHING MACHINE HAVING AN AUTOMATIC WORK-TRANSPORTING MECHANISM

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The invention relates to automatic fastener-attaching machines having automatic work-indexing mechanisms.

2. DESCRIPTION OF THE PRIOR ART

The prior art discloses various types of work moving mechanisms used in conjunction with automatic fastener-attaching machines. The older devices generally utilized an intricate cam arrangement for indexing a work-supporting plate or table responsive to the cycling of the fastener-attaching tools. Such devices, which were often extremely cumbersome, were rather inefficient in that consistently accurate spacing between successive attachments was difficult to obtain. The machines required constant maintenance and attention to insure proper synchronization of the indexing plate and fastener setting tools. Further, the conversion of a given machine from one job run to another wherein different fastener spacing was required necessitated the replacement of the control cams for indexing the work-supporting plate. This resulted in considerable machine down time and often specially trained personnel were needed to convert the machines from one job run to the next. The wearing of cam faces also led to inaccurate fastener spacing and, when detected, necessitated the replacement of the cams. A typical example of the cam operated type of work-moving plate is the disclose of U.S. Pat. No. 2,645,374 (G. D. Pickering). Later improvements in the art are disclosed in U.S. Pat. No. 3,331,544 (W. S. Bachman, Jr., et al.) and No. 3,263,887 (A. E. Demerest et al.).

In the U.S. Pat. No. 3,331,544, the work is held on the upper reach of an endless belt by a pressure plate and incrementally pulled past the fastener-attaching station responsive to a predetermined degree of rotation of the belt. The particular arrangement for indexing or moving the work is particularly adapted for applying a series of fasteners to cloth tapes which are later cut in sections and sewn into a garment. The machine is much more reliable than the earlier mentioned cam controlled devices with respect to accuracy of spacing between adjacent fasteners which can consistently be obtained, but the operation of the work-moving mechanism is such that it is only useful for effecting fastener attachments in situations where all fasteners in a given series are to be spaced equidistant from the adjacent fasteners in a series. Conversely, the Demerest et al. patent discloses a machine and work-moving mechanism which is particularly designed for setting a plurality of fasteners with any desired spacing between the fasteners on the work, and, by comparison with the early cam controlled machines, the Demerest et al. device is easily adjusted to a new job run requiring fastener spacing different from the previous application. However, the Demerest et al. design has proved to be deficient with respect to the capability of providing the consistently accurate spacing between fasteners which is demanded by garment manufacturers in that the patentees' mechanism for stopping the movement of the work for each fastener attachment is inefficient.

Thus it is the object of this invention to provide an improved work-moving mechanism for an automatic fastener-attaching machine which is extremely efficient in operation in that it makes possible the rapid attachment of a plurality of fasteners to the work, such as a garment or the like, with any desired spacing between fastener attachments and with extremely high accuracy in the spacing, which machine and mechanism are easily adjusted by only a moderately skilled operator to change from one job application to another wherein different fastener spacing is required.

SUMMARY OF THE INVENTION

Novelty is seen to reside in the combination of an automatic fastener-attaching machine and an automatic garment-indexing apparatus by which a plurality of fastener components may

be automatically attached to the garment in a series with any desired spacing between adjacent fasteners in the series and with consistently perfect accuracy in the spacing. The attaching machine has a vertically reciprocating ram which brings the fastener-setting tools together at an attaching station for the attachment of a fastener to the garment each time the ram descends. The ram is driven through a crank shaft controlled by a one revolution clutch so that the movement of the ram is limited to one complete down-up cycle each time the clutch is activated. The garment-indexing mechanism comprises a clamping device which automatically grips and holds the garment, drive means for propelling the clamping device past the attaching station, a gage which is connected to and movable simultaneously with the clamping device, which gage is propelled by the same driving means which power the clamping device, a plurality of mechanical stops which automatically and positively stop the travel of the gage and the clamping device when they have moved a predetermined distance dictated by the spacing desired between the leading edge of a garment and the first fastener attachment and between each of the subsequent attachments and the previous attachment. The stopping of the gages travel automatically activates the control clutch for cycling the ram so that a fastener is attached to the garment each time the gage stops. The indexing apparatus also includes a mechanism for automatically releasing the gage to permit it to travel a predetermined increment for the attachment of the succeeding fastener. The gage release mechanism is activated by means on the ram-driving crank shaft during the up stroke of the ram cycle.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary front elevational view of the basic fastener-attaching machine;

FIG. 2A is a top plan view of the left portion of the garment-indexing apparatus with the attaching station depicted schematically;

FIG. 2B is a top plan view of the right portion of the garment-indexing apparatus;

FIGS. 3A and 3B are left and right front elevational views of the indexing apparatus depicted in FIGS. 2A and 2B, respectively;

FIG. 4 is a section taken on line 4—4 of FIG. 2A; and

FIGS. 5 and 6 are sections taken on lines 5—5 and 6—6, respectively, of FIG. 2B with certain parts depicted fragmentarily.

DESCRIPTION OF A PREFERRED EMBODIMENT

The basic fastener attaching machine depicted in FIG. 1 is conventional, and since it will be well known to those familiar with the art it has been depicted diagrammatically. The machine has a main support frame 2 which rests on the floor and supports a head 4 having a vertically reciprocating punch or ram 6 mounted therein. The ram 6 on its descent or driving stroke cooperates with a lower die 7 to set a fastener element on a workpiece, such as a garment, which is disposed between the ram and the die at the attaching station A when the ram and die come together. Hoppers 8 feed component parts of the fastener combination to tracks 10 for automatic transport to the attaching tools. The component fastener parts may, for example, consist of a snap fastener stud and eyelet, or a socket and pronged ring, or a button and rivet, etc. The punch or ram is driven by a motor 12 through crank shaft 14 and connecting rod 16. Rotation of the crank shaft is controlled by a one revolution clutch 18. Clutch 18 is engaged for one full revolution of the crank shaft through a linkage 20 when solenoid 22 is energized. The left end of the crank shaft 14 carries a cam 24 which closes microswitch 26 during a portion of each revolution of the shaft for a purpose to be described hereinafter.

As best depicted in FIGS. 2A, 2B, 3A and 3B, the machine frame 2 supports a rectangular table top 28 which is mounted a slight distance below the level of the attaching station A and extends to the left, right and rear of the attaching station.

A reversible electric motor 30 is bolted to the underside of the left end of the table top 28. Power from the shaft of motor 30 is transmitted through fly wheel 31, belt 32 and sprocket 34 to input shaft 36 and thence through electromagnetic clutch 38 (when engaged) to output shaft 40. Shaft 40 passes through bushing 42 which is bolted to the table top, and the said shaft is keyed at its end to a drive pulley 44. The main drive belt 46 for the garment-indexing apparatus is tensioned over drive pulley 44, idler pulley 48 which is rotatably bracketed to the opposite end of the table top and lower idler pulley 50 which is rotatably, adjustably mounted on a support bracket 52. The upper, horizontal reach 54 of the belt is disposed slightly above the level of and to the rear of attaching station A.

A garment transporter support assembly front plate 56 which is bracketed perpendicular to the front edge of table top 28 and extends along a major portion of its length, and right angle bracket 58 which is bolted to the upper portion of the front plate 56 so that its horizontal leg 60 lies flush with the upper edge of the plate 56, supports the transporter slide bar 62 which is bolted to the horizontal leg 60 of the bracket 58. The slide bar 62 extends substantially the entire distance between drive pulley 44 and idler pulley 48.

Referring now to FIGS. 5 and 6 along with FIGS. 2 and 3, one will observe that the upper surface of the slide bar 62 has a horizontally extending track 64 mounted thereon. The center line of the track lies slightly to the rear of the middle of slide bar 62 and directly beneath the horizontal reach 54 of the belt 46. The main transporter slide block assemblies designated 66 in FIGS. 2B and 5 are slidably mounted on the track 64 and are also clamped to the horizontal reach of the belt 46. These main slide block assemblies are also clamped to cable 68 which will be described in further detail hereinafter. Between the main transporter slide blocks 66 there is mounted a Z-bar 7. The Z-bar is secured to its own slide block assemblies designated 72 in FIGS. 2B and 6, which assemblies are slidably mounted in the track 64 and are connected to the belt 46. As shown in FIG. 6 the Z-bar lies below the cable 68. A plurality of brackets 74 are secured at spaced intervals to the upper wing 76 of the Z-bar and on the forward ends of these brackets are rotatably mounted L-shaped clamps 78, the lower arms 80 of which are normally biased downwardly against the upper surface of the lower wing 82 of the Z-bar by springs 84. As be seen in FIG. 2B, the forward edge of the Z-bar and the clamps 78 are located slightly to the rear of the attaching station A, and the lower wing 82 of the Z-bar is disposed approximately at the level of the attaching station. The clamps 78 generally lie parallel to the vertical section of the Z-bar.

A plurality of L-shaped support brackets 86 which are bolted to table top 28 rotatably support an elongate circular rod 88. Actuating arms 90 have their upper ends fixed to the rod 88 and their lower ends clevised to connecting rods 92 which are spring loaded toward the front plate 56 and are connected to the operating arms of solenoids 94 and 96. A plurality of clamp-operating levers 98 are fixed to the rod 88 at selectively spaced intervals which are predetermined so that the forward, lower ends 100 thereof will overlie the right ends of the upper arms of the L-shaped clamps 78 when the garment transporter is in the retracted or starting position depicted in FIG. 2B and when the transporter has completed the garment-indexing run and moved to the left end of the apparatus depicted in FIG. 2A.

From a consideration of FIGS. 5 and 6, the reader will readily observe that when solenoids 94, 96 are energized and their operating arms retracted, actuating arms 90 and rod 88 are rotated counterclockwise as seen in FIG. 5 and clockwise in FIG. 6 so that the clamp-operating levers 98 are rotated downwardly and their lower ends 100 engage the upper arms of clamp 78 to pivot the lower arms 80 of same upwardly away from the upper surface of the lower wing 82 of the Z-bar against the bias of springs 84.

The reader should now refer to FIGS. 2A, 2B, 3A, 3B and 4 wherein one will observe that a pair of support brackets 102 and 104 which are bolted to the back portion of the table top

28 and extend upwardly therefrom behind the attaching machine head 4 carry a pair of gage support rods 106, 108 which extend parallel to each other between the brackets 102, 104. Each of the brackets 102, 104 has an upwardly extending arm 110 on its forward end which supports a gage stop release control rod 112 which extends therebetween parallel to but above and in front of the gage support rods 106, 108. Control rod 112 has a stop lever release blade 114 keyed thereto and extending downwardly toward the table top 28. An actuating lever 116 is clamped to the right end of control rod 112 (see FIG. 2B) and extends downwardly toward the table top 28 and has its lower end clevised to the operating arm 118 of solenoid 120 which is mounted on the table top 28. The operating arm 118 of solenoid 120 is normally spring biased to the rear as viewed in FIG. 2B so that when the solenoid is deenergized control rod 112 and blade 114 are rotated toward the rear of table top 28 or counterclockwise as viewed in FIG. 4.

A gage generally designated 122 is slidably mounted on the gage support rods 106, 108 for linear travel between stops 124 and 126 mounted on the rods at the left and right ends thereof, respectively. Various support blocks and brackets mount a plurality of idler pulleys 128 are rotatable in a horizontal plane parallel to table top 28 and all are disposed at equal height from the table top; in other words they are coplanar. Cable 68 mentioned earlier is threaded around the pulleys 128 and its ends are clamped to the gage 122 at 130, 132.

The upper rear portions of each of the support brackets 102, 104 has a notch formed therein and a roller bearing rotatably mounted in the notch. Rectangular gage stop support bar 134 rests on the roller bearings and is slidably retained in the notch by removable clamps 136 and 138 at its left and right ends, respectively. The bar 134, which is located above the rear portion of the gage 122, has a pair of short longitudinal stop plates 140, 142 bolted to its upper surface adjacent the clamps 136, 138 respectively. As best seen in FIG. 2B, clamp 138 has a leftwardly extending flange 144 which lies above bar 134 and stop plate 142 and the right portion of clamp 138 has a slot 146 formed therein and paralleling bar 134. A coil spring 148 has one end connected to a pin on the clamp flange 144 and its opposite end connected to a pin which is fixed to the right end of bar 134 and extends upwardly through the slot 146. Thus the bar 134 is movably biased to the left (as viewed in FIG. 2B) by the spring 148 and the bar is free to be moved back and forth on the roller bearings mounted in brackets 102, 104 to the extent permitted by the engagement of the stop plates 140, 142 with the facing surfaces of the clamps 136, 138. A microswitch 150 is mounted adjacent the left end of the bar 134. This switch is wired closed and its movable contact is normally held open by the left end of the bar 134 engaging its spring-loaded control button 152 and pressing same inwardly under the bias of spring 148, the gage of spring 148 being heavier than the gage of the spring on the control button 152.

A plurality of gage stops 154 are clamped to the bar 134 at spaced intervals by easily releasably setscrews. The top face of the bar may be provided with a rule to assist an operator in fixing the positions of the stops 154. The forward face 156 of each of the stops is horizontally bevelled from right to left as viewed in FIG. 2A.

As best depicted in FIGS. 2A and 4, the gage 122 has a gage stop lever assembly 158 mounted on the forward top portion thereof. The gage stop lever assembly includes a block 160 having a lateral channel 162 formed therein and a small lateral slot 164 opening at its upper surface and in communication with the channel 162, a stop lever 166 slidably mounted in the channel 162, and a coil spring 168 having one end connected to a pin 172 which is fixed to the stop lever 166 and extends upwardly through the slot 164. The stop lever includes a horizontal arm 174 having a rear end face 176 which is bevelled from left to right as viewed in FIG. 2A, and a vertical arm 178 which is normally pulled to the rear, or the right as seen in FIG. 4, against the front face of blade 114 by spring 168. The lower portion of the gage 122 carries a bracket 180 having horizontal arms 182 and 184.

Normally open microswitches 186 and 188 are mounted on the table top 28. The former is mounted in front of gage support rod 108 below gage stop release control rod 112 and adjacent the left end of rod 108, and the switch 118 is located in back of support rod 106 adjacent the right end thereof. The switches 186 and 188 are wired closed and have spring-biased normally open contact control arms which lie in the path of travel of the horizontal arms 182, 184 of the bracket 180 on the gage when the latter moves along the support rods 106, 108 between stops 124 and 126.

Having described the major components of my invention in detail I now proceed to a description of its operation. In the course of describing the operation I will make reference to various electrical controls, in addition to those already mentioned, however, I have not deemed it necessary to resort to the use of a wiring diagram or electrical control schematic in conjunction with the description in that all of the electrical control components are standard and their operation and wiring will be well understood by an artisan having a working knowledge of electronics. It is sufficient to say that the electrical components not already described are located in a control box (not shown in the drawings) which is mounted on the outside of the machine frame 2. For the purpose of lending continuity to the description of the operation, we shall assume that the garment transporter and the gage are in their retracted or starting positions as depicted in 2A and 2B when power is first applied to the machine. One should also note that since the gage is retracted, microswitch 186 is closed since arm 182 on gage bracket 180 is in contact with the switch's control arm. The operator starts the machine by turning on a main power switch located on a control console (not shown) to activate the ram drive motor 12. Thereafter a transporter power switch on the same console is turned on. When the latter switch is closed, garment clamps 78 are opened because solenoid 94 is energized and actuating arms 90, rod 88 and clamp-operating levers 98 are rotated counterclockwise as depicted in FIG. 5. The closing of the transporter switch also starts motor 30 which is operating in a reverse or return mode, that is in a direction which, if clutch 38 were engaged, would rotate main drive belt 46 clockwise as viewed in FIGS. 3A and 3B, which in turn would drive the transporter mechanism to the right as seen in FIG. 2B and the cable 68 which is clamped to the belt counterclockwise in the same figure whereby the gage 122 is moved to the left in FIG. 2A against the stops 124. The operator next positions a garment to which fasteners are to be attached on the lower wing 82 of the Z-bar 70 with the edge of the garment up against the vertical section of the Z-bar and partially depresses a two stage foot switch (not shown) which rests on the floor in front of the machine frame 2 thereby closing the first stage of the said switch. The closing of stage one of the foot switch activates clutch 38 to impart rotation to output shaft 40, applies power to microswitch 150 mounted on table top 28 to the left of gage stop support bar 134 and causes a relay which controls solenoid 94 to drop out thereby deenergizing the solenoid and allowing connecting rod 92 to move forward and raise the clamp operating levers 98 so that the garment is immediately clamped to the wing 82 of the Z-bar. The operator now depresses the foot switch further to close its second stage. When foot switch stage two closes, a timer is energized which times out in one-tenth of a second. When the timer times out, its contacts close and permit a latching relay to pick up. When the latching relay contacts close, the potential on the leads to motor 30 is reversed through the closing of the motor control relay contacts. The closing of the latching relay contacts also insures that power is maintained on the microswitch 150 and the clutch 38 even if the operator should release the foot switch.

As soon as the motor reverses, the main drive belt 46 begins rotating counterclockwise as viewed in FIGS. 3A and 3B (since clutch 38 is already engaged), the garment transporter assembly including slide block assemblies 66 and the Z-bar 70 and clamps 78 are propelled along the track 64 toward the attaching station A. Simultaneously cable 68 which is clamped

to belt 46 begins rotating clockwise as viewed in FIGS. 2A and 2B and gage 122 is propelled to the right in the same figures until the rear end of stop lever arm 174 engages the forward end of the first stop 154 mounted on the bar 134. When the stop lever arm strikes the stop, bar 134 is pulsed slightly to the right until stop plate 142 hits the adjacent face of clamp 138 at which point all movement of the gage and garment are positively stopped. Simultaneously with the movement or pulsing of support bar 134 microswitch control button 152 is released and the switch 150 closes. When microswitch 150 closes, solenoid 22 is energized and ram 6 descends and attaches a fastener to the garment. On the latter portion of the clutch-controlled single revolution of crank shaft 14 and while the ram is ascending, cam 24 closes microswitch 26 momentarily which in turn deenergizes solenoid 22 and energizes solenoid 120. When solenoid 120 fires, its operating arm pulls in and through clamp 116, rotates control rod 112 and blades 114 clockwise as seen in FIG. 4. The aforementioned rotation of blade 114 acts on flange 178 to retract stop lever arm 174 and the gage moves past the stop 154 and the transporter and garment move further past attaching station A. As soon as the gage is released, bar 134 retracts under bias of spring 148 and opens microswitch 150. Since microswitch 26 opens almost immediately solenoid 120 drops out and stop lever 166 is pulled back into the path of the succeeding stops by spring 168. The gage thereafter continues along support rods 106, 108 until stop lever arm 174 strikes the next stop 154 and the gage and garment transporter stop and microswitch 150 opens and the ram descends for the next attachment and so on repeating the above described sequence until the gage clears the last stop on the bar and all fastener attachments have been made.

When the gage completes its travel to the right in FIG. 2B and comes to rest against stops 126, the right or rear arm 184 on bracket 180 engages the contact control arm on microswitch 188 and closes that switch. The closing of switch 188 energizes a second timer, cuts off power to the clutch 38 causing the same to disengage, and energizes a relay which closes to in turn energize solenoid 96. When solenoid 96 pulls in, actuating arm 90 on the left end of rod 88 rotates the rod and the clamp-operating levers on that end of the rod downwardly or clockwise in FIG. 6 to open the clamps 98 and permit the operator to remove the garment. The last mentioned timer is of the variable set type which is usually programmed or set out in from $\frac{1}{4}$ to $\frac{1}{2}$ seconds or whatever a time is deemed necessary for the operator to remove the garment from the transporter. When the timer has run out and its contacts close, it switches the aforementioned latching relay which in turn closes the motor 30's control relay and the potential on the leads to the motor is reversed. The closing of the timer contacts also deenergizes solenoid 96 allowing the clamps to close and closes the relay controlling the power to clutch 38, so that the clutch reengages and the motor 30 (now reversed) drives the main belt 46 clockwise to retract the gage and garment transporter. As the gage retracts, the meshing of the bevelled faces 156 and 176 on the stops and stop lever, respectively, trips the lever 166 and blade 114 against the bias of spring 168, so that the gage in effect rides past each of the stops.

When the gage returns to the starting position and comes to rest against the stops 124, bracket arm 182 closes microswitch 186 and energizes a relay which closes to in turn energize solenoid 96 to depress clamp-operating levers 98 thereby raising clamps 78 (since the transporter is also now fully retracted) and deenergizes electromagnetic clutch 38. At this point the operator inserts the next garment and depresses the foot switch to close stage one and the entire sequence is repeated.

As was earlier mentioned the stops 154 are clamped to the bar 134 by setscrews which are easily released for relocation of the stops along the bar to convert from one job application to another wherein different spacing between fasteners is desired. Any number of stops may be positioned on the bar 134 depending on the number of fasteners to be attached to a

given garment and the spacing between fasteners may vary from almost any maximum to a minimum of 9/16".

The clamps 136, 138 which hold the bar 134 on the roller bearings in the notches of support brackets 102, 104 are also easily removed by backing off four screws. Thus, if a manufacturer produces different lines of garments having different spacing between fasteners which are repetitively run according to production control schedules, he may utilize a plurality of different support bars 134 with the stops 154 always positioned at the same given intervals on each of the bars and then simply change bars rather than adjust the individual stops to convert from one job to the next. This latter procedure would of course tend to reduce production errors deriving from inaccurate positioning of the stops on a support bar since the individual stops, once accurately located, are not subsequently moved by an operator.

The reader will also appreciate that a series of guide lines which in effect act as a template may be inscribed on the lower wing 82 of the Z bar to assist an operator in properly positioning the leading edge of the garment dictated by the spacing of the gage stops.

It is also contemplated that the electrical controls and wiring might be modified to permit programming of the machine to perform a plurality of different jobs requiring different fastener spacing without either adjusting the stops 154 on the support bar 134 or interchanging stop support bars having stops positioned at different intervals. For example, let us assume that a given manufacturer produces a line of stormcoats on which four different variations in fastener spacing are required on four distinct models in the line. The electrical controls could be modified by connecting a stepping relay having sixteen contacts between the microswitch 150 and a relay controlling solenoid 120. A four position selector switch would be wired to control the output from the stepping relay contacts. Stops 154 would be permanently positioned along stop support bar 134 in groups or clusters of four with the clusters and individual stops in the clusters spaced in accordance with the fastener spacing desired on the four stormcoat models. The Z-bar would have four spaced scribe lines to assist the operator in positioning the leading edge of the various models and the selector switch would be turned to any of positions 1 through 4 depending on the model to which fasteners were to be fixed. The wiring between the various electrical components would be such that when the selector switch was in position one the ram would cycle only when the gage stop lever arm 174 engaged stops 1, 5, 9 and 13 on the bar with the stepping relay and solenoid 120 pulsing to permit the gage to index past the remaining stops without firing the ram. For making attachments to another coat model the operator would rotate the selector switch to position 2 and place the leading edge of the coat at another scribe on the Z-bar and the ram would then fire when stops 2, 6, 10 and 14 were engaged, with the gage-indexing past the remaining stops without activation of the ram. Likewise, the setting of the selector switch at positions three or four would result in automatic attachment of fasteners at the proper spacings on the remaining coat models. Thus, four different jobs could be run without adjusting stops or replacing stop support bars simply by changing settings on the selector switch and positioning the leading edges of the coats to correspond to the switch settings.

It is also anticipated that additional improvements and modifications might be incorporated in the machine without departing from the scope of the invention which is best defined by the following claims.

I claim:

1. In combination with an automatic fastener-attaching machine for setting a plurality of fasteners in series on a garment or the like, the machine being of the type having a vertically reciprocating ram for attaching a fastener to the garment at an attaching station each time the ram descends, and wherein the ram driving mechanism includes control means

which limit the movement of the ram to one complete down-up cycle each time the said control means is activated; an automatic garment-indexing apparatus for incrementally advancing a garment past the fastener-setting station according to the spacing desired between each of the attached fasteners, said indexing apparatus comprising:

- a. a clamping device for grasping and holding the garment,
- b. driving means for propelling the clamping device past the attaching station,
- c. a gage connected to and movable simultaneously with the clamping device and propelled by the said driving means,
- d. means for automatically and positively stopping the travel of said gage and said clamping device when the gage has moved a predetermined distance, said means being arranged to automatically activate the control means for cycling the ram whereby a fastener is attached to the garment each time the gage is positively stopped, and
- e. a mechanism for releasing the said means of clause d, said mechanism having control means activated by the ram driving mechanism during the up stroke of the ram cycle to permit the gage to move a predetermined increment for the attachment of the next succeeding fastener.

2. The combination according to claim 1 wherein the said means for automatically and positively stopping the travel of said gage includes a plurality of fixed adjustable stops mounted on a stop support, said stop support being disposed generally parallel to the direction of movement of said gage and said stops being disposed generally normal to the direction of movement of said gage, and said gage carrying a retractable stop engager disposed generally parallel to and at the level of said stops, whereby said gage comes to rest when said stop engager strikes any one of said stops.

3. The combination according to claim 2 wherein said stop support is mounted for limited linear movement responsive to the striking of any one of said stops by said stop engager, and the control means for cycling the ram includes a switch which is tripped by said stop support to activate the ram driving mechanism when said stop support is so moved.

4. The combination according to claim 1 wherein said clamping device includes an elongate garment support bar, a plurality of spring loaded arms normally biased against said garment support bar, and automatically operable means for lifting said spring arms away from said support bar for the placement of a garment on said bar beneath said arms and for automatically releasing said arms whereby said arms spring back toward said bar to hold the garment against said bar and for automatically lifting said arms away from said bar subsequent to the attachment of fasteners to the garment.

5. The combination according to claim 1 wherein said driving means for propelling said clamping device past the attaching station includes a reversible electric motor, a drive pulley connected to an output drive shaft, a drive belt, said belt being connected to said drive pulley, a cable connected to said drive belt, said clamping device and said gage, said cable being rotatable in a plane which is generally parallel to the plane of said attaching station responsive to rotation of said drive pulley and drive belt and a clutch for imparting the driving torque of said motor to the output drive shaft for driving said drive pulley.

6. The combination according to claim 2 wherein the mechanism and control means of clause e, claim 1, includes a rotatable stop engager release lever mounted generally parallel to said stop support and in engagement with said stop engager, a clamp having one end secured to the said release lever and another end coupled to the operating arm of a solenoid, a switch for energizing said solenoid, said switch being closed by the ram driving mechanism during a portion of the upstroke of the ram whereby the operating arm of said solenoid imparts rotational movement to said clamp and said release lever to retract said stop engager from said stops thereby releasing said gage.