Aug. 9, 1966 C. M. WILSON 3,265,275

APPARATUS FOR ATTACHING PRONGED DEVICES TO FABRIC OR OTHER FLEXIBLE MATERIAL

Filed Oct. 14, 1964 7 Sheets-Sheet 1

FIG. 1.

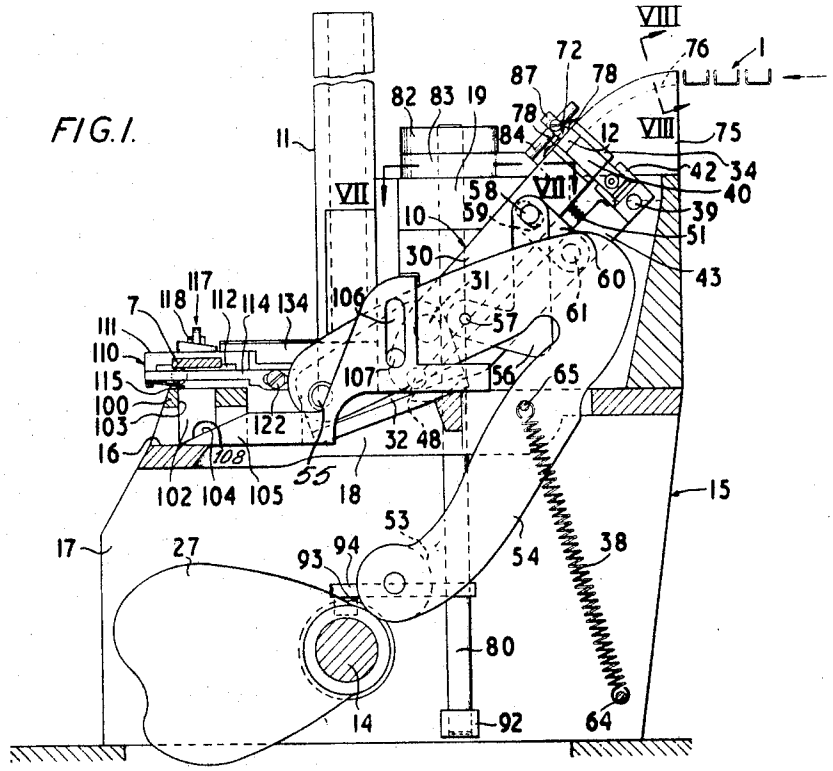
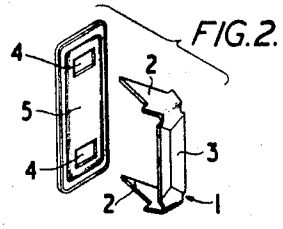


FIG. 2.



Inventor
C. M. Wilson

By Richards & Geier
Attorneys

Aug. 9, 1966 C. M. WILSON 3,265,275

APPARATUS FOR ATTACHING PRONGED DEVICES TO FABRIC OR OTHER FLEXIBLE MATERIAL

Filed Oct. 14, 1964 7 Sheets-Sheet 2

FIG. 3.

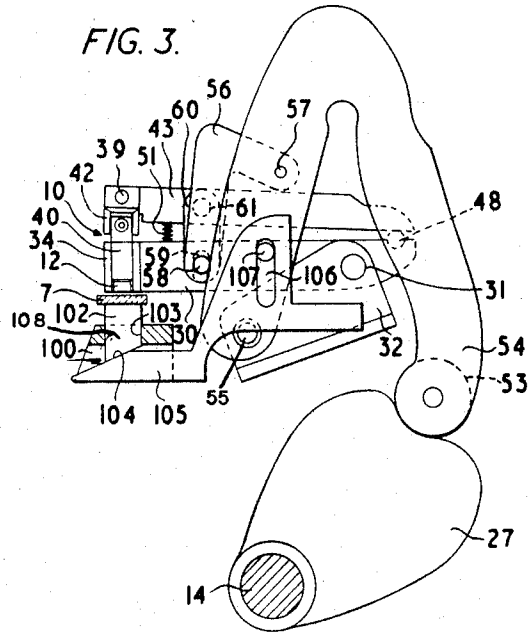
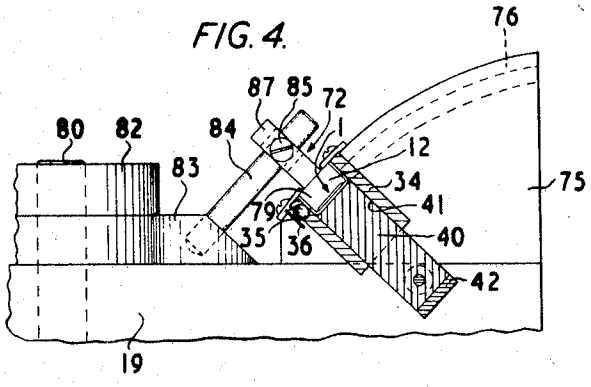


FIG. 4.



Inventor
C. M. Wilson
By Richards & Geier
Attorneys

Aug. 9, 1966 C. M. WILSON 3,265,275

APPARATUS FOR ATTACHING PRONGED DEVICES TO FABRIC OR OTHER FLEXIBLE MATERIAL

Filed Oct. 14, 1964 7 Sheets-Sheet 3

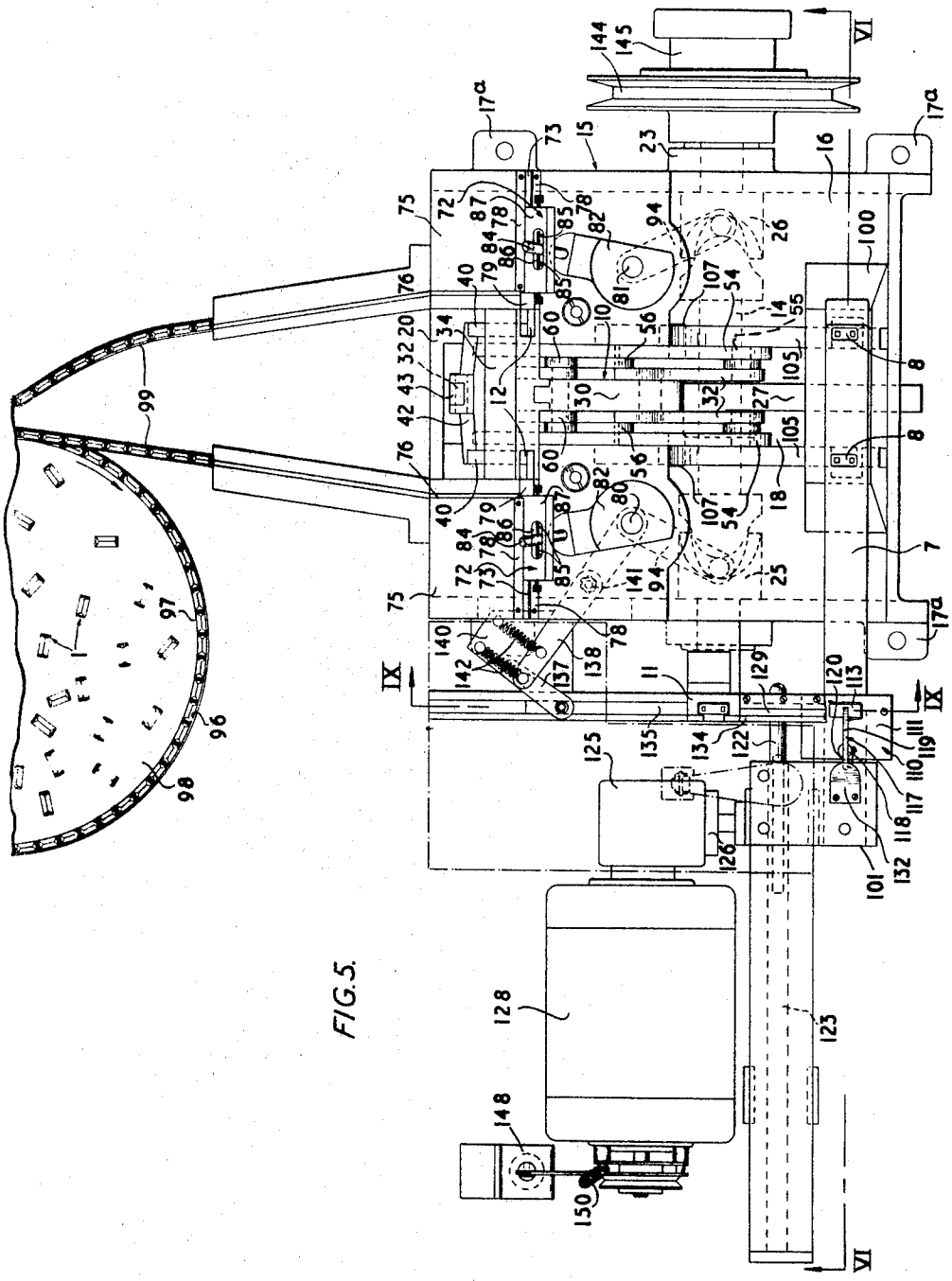


FIG. 5.

Inventor
C. M. Wilson
By Richards & Geier
Attorneys

Aug. 9, 1966 C. M. WILSON 3,265,275

APPARATUS FOR ATTACHING PRONGED DEVICES TO FABRIC OR OTHER FLEXIBLE MATERIAL

Filed Oct. 14, 1964 7 Sheets-Sheet 4

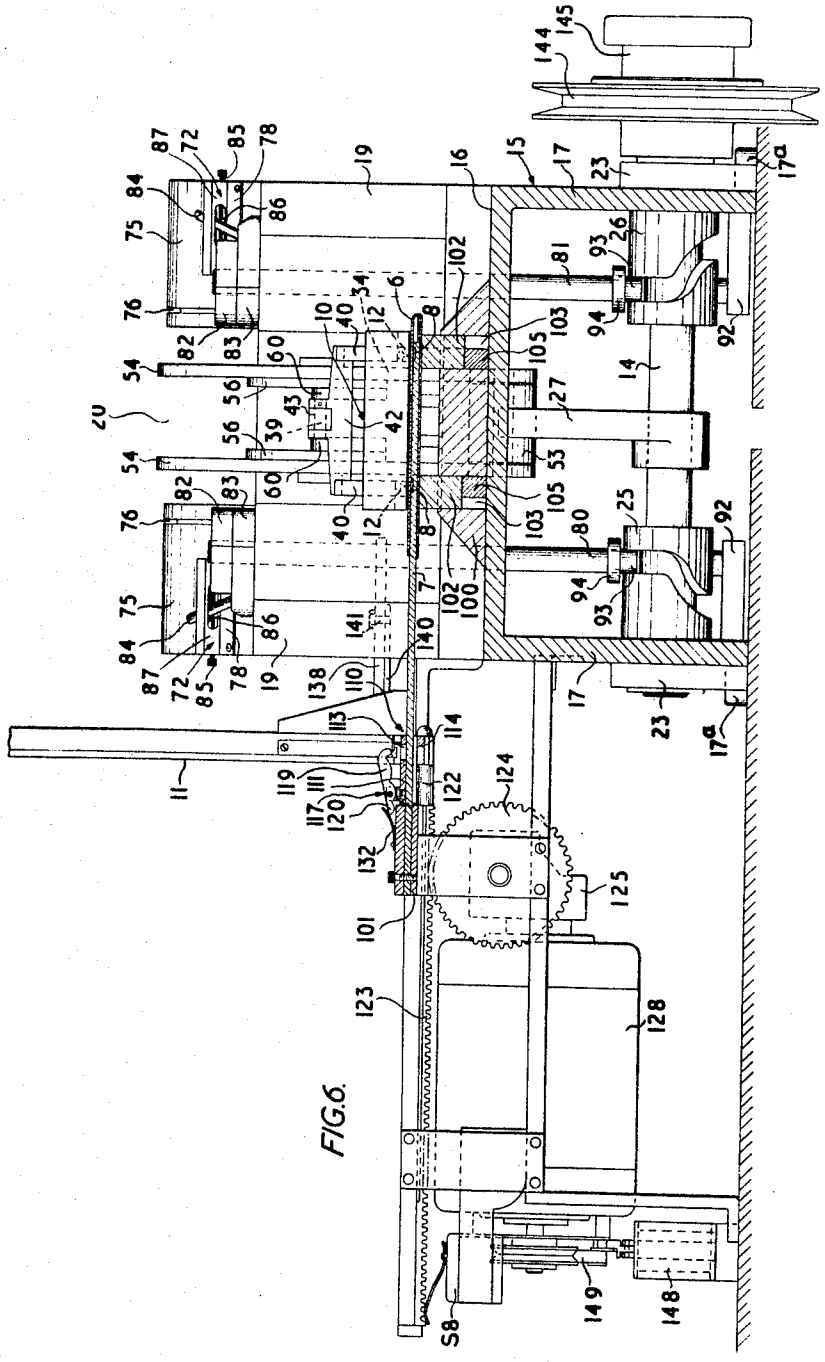


FIG. 6.

Inventor
C. M. Wilson
By Richards & Geier
Attorneys

Aug. 9, 1966 C. M. WILSON 3,265,275

APPARATUS FOR ATTACHING PRONGED DEVICES TO FABRIC OR OTHER FLEXIBLE MATERIAL

Filed Oct. 14, 1964 7 Sheets-Sheet 5

FIG. 7

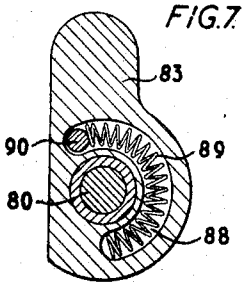


FIG. 10.

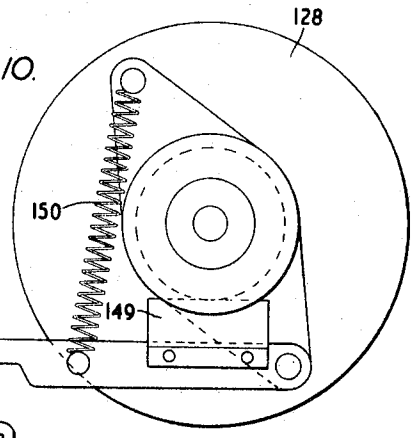


FIG. 8.

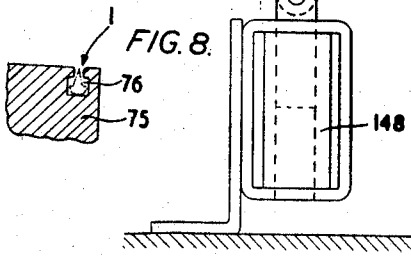
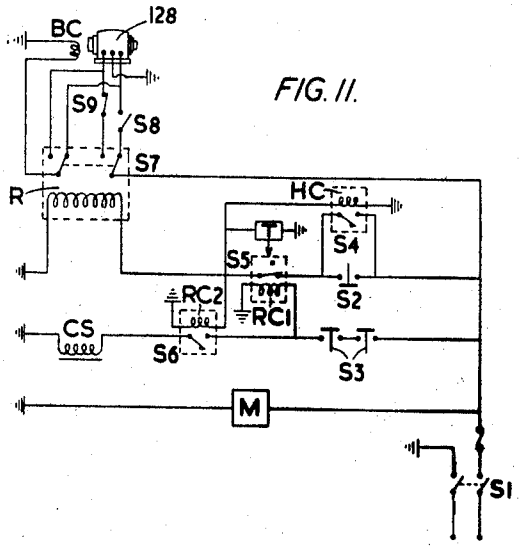


FIG. 11.



Inventor
C. M. Wilson
By Richards & Geier
Attorneys

Aug. 9, 1966 C. M. WILSON 3,265,275

APPARATUS FOR ATTACHING PRONGED DEVICES TO FABRIC OR OTHER FLEXIBLE MATERIAL

Filed Oct. 14, 1964 7 Sheets-Sheet 6

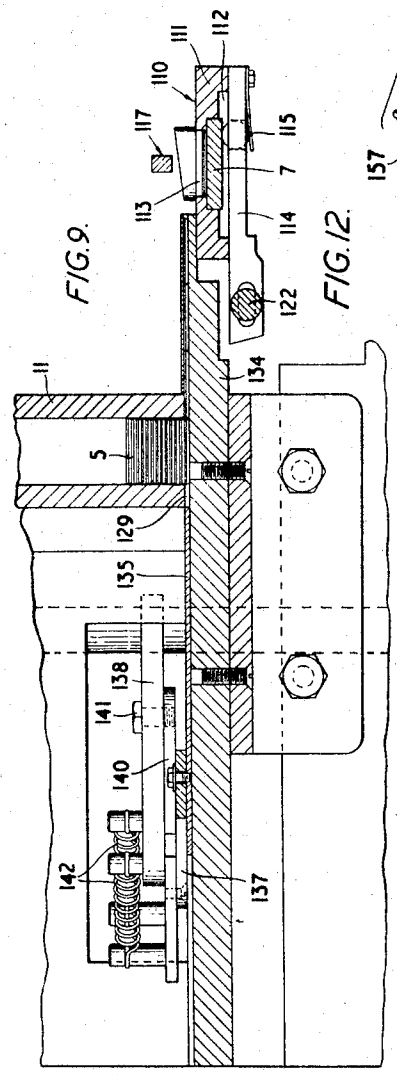


FIG. 9.

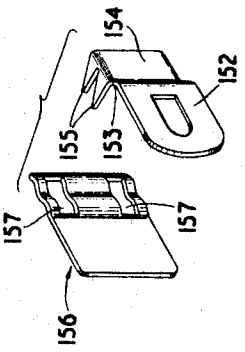


FIG. 12.

Inventor
C. M. Wilson

By Richards & Geier
Attorneys

Aug. 9, 1966 C. M. WILSON 3,265,275

APPARATUS FOR ATTACHING PRONGED DEVICES TO FABRIC OR OTHER FLEXIBLE MATERIAL

Filed Oct. 14, 1964 7 Sheets-Sheet 7

FIG. 13.

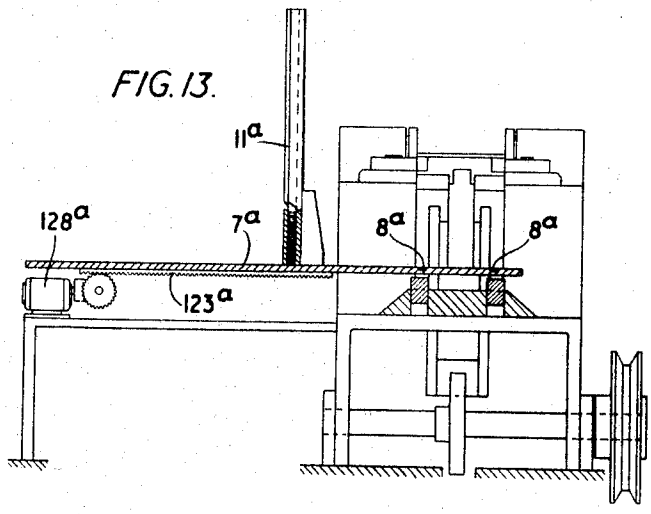


FIG. 14.

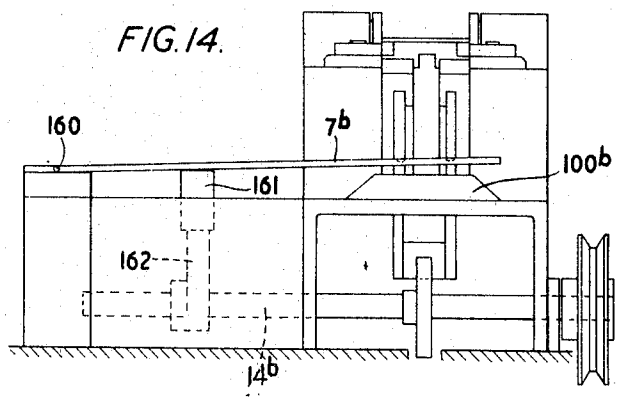
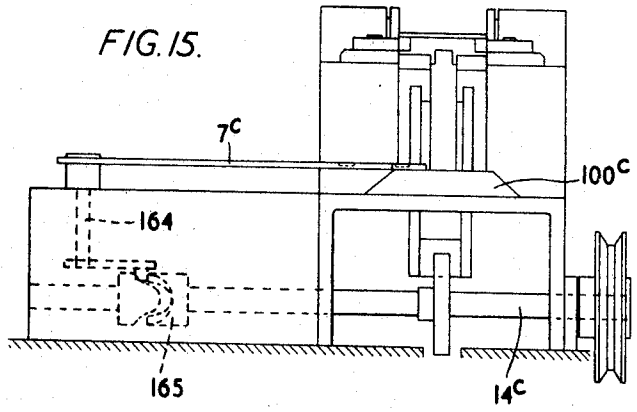


FIG. 15.



Inventor
C. M. Wilson
By Richards & Geier
Attorneys

United States Patent Office 3,265,275 Patented August 9, 1966

3,265,275

APPARATUS FOR ATTACHING PRONGED DEVICES TO FABRIC OR OTHER FLEXIBLE MATERIAL

Clarence Martin Wilson, Birmingham, England, assignor to Thomas Walker Limited, Birmingham, England, a British company

Filed Oct. 14, 1964, Ser. No. 403,767
Claims priority, application Great Britain, Oct. 16, 1963, 40,765/63
5 Claims. (Cl. 227—18)

This invention relates to apparatus for attaching pronged devices, such as pronged fastening hooks and staples for wearing apparel, to fabric or other flexible material, said pronged devices being of the kind in which the prongs of the prong-carrying part are designed to penetrate through the material and to be then clenched or folded-over in order to secure the device in place.

The invention is more particularly concerned with such apparatus which includes a mandrel in the form of an elongated bar or plate provided with an associated pronged clenching part or parts, said mandrel being insertable into a pocket or sleeve portion of a garment, such as a trousers' waistband, so as to facilitate the attachment of the pronged devices thereto.

An object of the present invention is to provide an improved construction of such apparatus which is adapted for automatic operation.

Another object is the provision of effective means for mechanically loading the mandrel with back plate components of the pronged devices, said means being particularly suitable for an apparatus designed for simultaneous attachment of a plurality of pronged devices.

Other objects of the present invention will become apparent in the course of the following specification.

In accomplishing the objects of the present invention according to one preferred embodiment, the mandrel may be mounted as a cantilever with a slidably mounted movable supporting member under its free end which is arranged to be moved into supporting engagement immediately prior to the clenching operation, and which is withdrawn to an inoperative position in order to leave the mandrel free for insertion into the pocket or sleeve portion of garment material. In other forms, however, the mandrel may itself be movably supported, so that it is displaceable between an operative supported position and a free unsupported position in which it is adapted to be inserted into the pocket or sleeve portion.

By way of example, a convenient embodiment of the invention will now be more particularly described, with reference to the accompanying drawings, in connection with apparatus designed especially for attaching simultaneously and in spaced relation, a pair of pronged staples, for use with complementary hook fasteners, to a pocket or sleeve part of a garment, such as trousers' waistband, said staples being associated with complementary sheet-metal, apertured back-plates.

In said drawings:

FIGURE 1 is a longitudinal section of the clenching press of said embodiment;

FIGURE 2 is a perspective view illustrating the kind of staple or eye fastening components, and associated back plates, with which the press is intended to be used;

FIGURE 3 is a view showing the clenching head and operating parts immediately prior to a clenching operation;

FIGURE 4 is a detail vertical sectional view through one of the workpiece holders in its loading position;

FIGURE 5 is a plan view of the apparatus;

FIGURE 6 is a vertical section on line VI—VI of FIGURE 5;

FIGURE 7 is a section on line VII—VII of FIGURE 1;

FIGURE 8 is a section on line VIII—VIII of FIGURE 1;

FIGURE 9 is a vertical section on line IX—IX of FIGURE 6;

FIGURE 10 is an end elevation of the rack pinion drive motor;

FIGURE 11 is a simplified circuit diagram;

FIGURE 12 is a perspective view of a pronged hook fastening component and associated backing plate;

FIGURE 13 illustrates a modified means of loading the mandrel with backing plates; and

FIGURES 14 and 15 show diagrammatically modified mandrel arrangements.

Referring first to FIGURE 2 of the drawings, it will be seen that the staple or eye fastening components **1** comprise a sheet-metal bar **3** having a depending shouldered prong **2** at each end and in the attachment to the garment material, the prongs **2** are passed through the material and through apertures **4** in the complementary sheet-metal backing plate **5** positioned on the underside against which they are bent over or clenched in known manner.

The press to be described, with reference to the drawings, is designed not only to carry out the attachment operation of a pair of staples **1**, simultaneously, but also to provide an automatic feed of both the staple or eye components **1** and the backing plates **5** so that no loading of the machine is necessary by the operator between each individual operation.

In effecting an attachment operation, the garment material, for example, a trousers' waistband made-up into the form of a pocket or sleeve and indicated by the reference **6** in FIGURE 6, is fitted over a tongue-like mandrel **7** which carries a pair of spaced anvil recesses **8, 8** in which backing plates **5** are positioned, and by means of a pivoted carrier arm the staple or eye components **1** are brought into position over the anvils and are driven downwards so that their prongs **2** penetrate the material and backing plate apertures **4** and are clenched over by clenching surfaces of the anvil.

In the drawings, the carrier arm is indicated generally by the reference **10**. In the operative clenching position, this carrier arm extends forwardly and substantially horizontally, as indicated in FIGURE 3, but after each attachment operation it swings back through an angle of approximately 135° to a rear loading position shown in FIGURE 1 so that the working space above the mandrel **7** is normally clear and unobstructed.

The backing plates **5** are substantially rectangular in shape and are fed to the anvil recesses **8, 8** on the mandrel from a suitable storage magazine **11**, as hereinafter described, whilst the staples or eye components **1** are fed to, and inserted or loaded simultaneously in holders **12, 12**, of the carrier arm **10** whilst the latter is in its aforesaid rear loading position.

The feed operations and clenching operation of the press, and operation of the mandrel, are conveniently synchronised and controlled from a common cam shaft **14** which is adapted to be power driven.

The press comprises a main base frame **15** in the form of a hollow box-like casting having a flat top **16** and parallel rectangular side walls **17, 17**, carrying integral feet or lugs **17***a* for securing to a work bench.

Formed in the flat top **16** of the base frame **15** is a large rectangular aperture **18** which accommodates the pivoted carrier arm mounting and operating levers, and towards the rear, on either side of the said aperture **18**, are two large upstanding rectangular pillars **19, 19**, which are spaced apart laterally to provide a vertical slot **20** between their opposed faces which accommodates the

pivoted carrier arm **10** when the latter is in its rear loading position. The front portions of the opposing faces of these pillars **19, 19**, are also recessed for accommodating part of the mounting and operating mechanism of the carrier arm **10**.

The common camshaft **14** controlling the operation of the machine extends transversely across the lower part of the base frame **15**, being mounted in journal bearings **23, 23**, in the side walls **17, 17**, of the latter, and as shown in FIGURE 6, it carries within the interior of the base frame, three cams **25, 26, 27**, of which two (**25, 26**) control the loading mechanism for the staples and the third (**27**) controls the actuation of the carrier arm **10** for carrying out the clenching operation.

The carrier arm **10** itself is substantially T-shaped and comprises a straight main bar **30** which is pivoted towards its inner end on a cross-shaft **31**, between a pair of side plates **32, 32**, fixed to the base frame **15**, these side plates **32, 32**, projecting through the aperture **18** in the top of the latter.

Adjacent its outer end, this main bar **30** of the carrier arm is secured to a cross-bar **34** forming the cross-head of the T, and a workpiece holder **12** for the pronged hooks is provided at each end of this cross-bar **34**, each holder being in the form of a suitably dimensioned rectangular recess which has a side opening in the respective outer end face of the cross-bar **34** for the lateral insertion of the staple workpieces **1**. As seen in FIGURE 4, a steel ball **35** biased by a blade spring **36** projects slightly into the recess of each holder **12** from the outer end wall so as to engage a staple therein and exert a light frictional retaining pressure.

The carrier arm **10** is spring loaded by extension springs **38, 38**, connected as hereinafter described so that it normally takes up its rear loading position in which it slopes upwardly and rearwardly. The staples **1** are loaded into the holders **12, 12**, whilst the carrier arm **10** is in this rear position but in the clenching operation, the carrier arm swings in a vertical plane, forwards and down into a substantially horizontal position as previously mentioned in which the staple holders **12, 12** are directly above the anvils **8, 8** on the mandrel **7**.

In the clenching operation, each staple **1** in the holders **12, 12**, is then ejected by being driven downwards, which action causes the prongs **2** to penetrate through material laid over the anvils **8, 8**, the prongs then passing through the apertures **4** in the backing plates **5** and being clenched over by inclined clenching surfaces within the anvil recesses. The latter operation is accomplished by ejector plungers **40** (see especially FIGURE 3) slidably mounted in rectangular slots **41** passing through the outer ends of the cross-bar **34** of the carrier arm into the recesses of the holders **12, 12**, the upper end of each ejector plunger **40** being connected to a common cross member **42** which is pivotally coupled at **39** to a pressure lever **43** carried by the main bar **30** which is actuated at the end of the forward stroke of the carrier arm. FIGURE 3 illustrates the carrier arm and operating parts immediately before actuation of the pressure lever **43**, and ejector plungers **40**.

The pressure lever **43** lies above the main bar **30** of the carrier arm (in the operative clenching position), in spaced parallel relation thereto, and it is arranged to pivot about a fulcrum formed by a roller **48** (see FIGURES 1 and 3) interposed between its inner end and the inner end of the carrier arm main bar, and the outer end of the pressure lever is urged away from the carrier arm main bar by an interposed compression spring **51** so that the ejector plunger **40** is normally maintained in its raised position.

The carrier arm **10** is arranged to be actuated by the clenching cam **27** on the common camshaft **14** through a lever and linkage system. The clenching cam **27** is engaged by a cylindrical cam follower **53** carried between opposed ends of a pair of parallel, spaced-apart levers **54, 54**, of inverted V-shape which are pivoted at their other ends on a forwardly-positioned cross shaft **55** mounted on the side plates **32** between which the carrier arm **7** is pivoted. These V-shaped levers **54, 54**, are positioned one at each side of the carrier arm **10** and are coupled to the latter by a pair of angularly-movable connecting links **56, 56**, the one end of these connecting links **56, 56**, being pivotally connected by pivot pins **57** to the respective V-shaped levers **54** as indicated in FIGURES 1 and 3, and the other ends of these connecting links are pivotally connected to the carrier arm **10** by a common pivot pin **58** engaged in a transverse slot **59** in the carrier arm main bar **30**. This common pivot pin **58** also carries a second pair of short links **60, 60** which are pivotally connected at their upper ends to a cross pin **61** on the pressure lever **43** at an intermediate position along the length of the latter.

On turning the clenching cam **27** clockwise from the position of FIG. 1 to that of FIG. 3, the inverted V-shaped levers **54** are rocked in a counter-clockwise direction and the movement transmitted to the connecting links **56** causes the carrier arm **10** to swing forwardly from its normal rear loading position until movement of the main bar **30** thereof is arrested by its cross-bar **34** being brought down onto the mandrel **7** (FIG. 3). Further movement of the V-shaped levers **54, 54**, caused by a further displacement of the cam **27**, then transmitted to the connecting links **56, 56**, moves the common pivot pin **58** of the latter down in the slot **59** of the carrier arm main bar **30**, and movement is thereby transmitted through the second pair of links **60, 60**, to the pressure lever **43** which is rocked downwards, together with cross-bar **34**, relatively to the carrier arm main bar, against the biassing compression spring, **51**, so that the ejector plungers **40, 40**, are caused to descend, thereby driving the staples **1** out of the holders **12, 12**, and effecting the clenching operation. At the end of the operative stroke of the press, the carrier arm **10** is returned to its rear loading position by the springs **38, 38**, which are anchored at opposite ends to a fixed cross-shaft **64** of the base frame **15** and to pins **65** on the V-shaped operating levers **54** respectively.

Automatic loading of the pronged staples **1** into the holders **12, 12**, of the carrier arm **10** when the latter is in its rear loading position is effected by two sets of similar loading mechanism carried respectively by the two pillars **19, 19**.

Each set of loading mechanism comprises a reciprocatable loading feed slide **72** slidably mounted in a guideway **73** extending laterally, in alignment with the adjacent carrier arm holding **12**.

This guideway **73** is formed by a channel in a sloping front face of a block **75** secured on the top face of the associated pillar **19** and the staples **1** enter into this guideway **73** with their prongs **2** directed upwards and outwards from a rearwardly-extending delivery channel **76** supplied by a continuous feeding device external to the press. After each staple **1** enters the guideway **73**, prior to the next clenching operation of the press, the staple loading feed slide **72** moves across, as shown in FIGURE 5, and pushes the staple laterally into the adjacent carrier arm holder **12**, through the open side of the latter. In so doing, the feed slide **72** closes the end of the delivery channel **76** so that another staple cannot enter into the guideway **73** until the slide **72** is retracted on completion of the loading operation.

The staple loading feed slide **72** comprises a T-sectioned bar of which the head part is confined within the guideway **73** by a pair of overlapping guide plates **78, 78**, an extension **79** of said head part having a bevelled end which engages the staples **1** emerging from the channel **76**.

The operation of the staple loading feed slides **72** is controlled by the cams **25** and **26** which are arranged to impart an oscillation to vertical shafts **80, 81**, passing

upwardly through both the base frame 11 and the pillars 19 the top ends of these vertical shafts 80 and 81 being operatively connected through a pair of spring-coupled cam discs 82, 83, to said slides 72.

The pair of spring-coupled cam discs 82, 83, forms a convenient overload safety device preventing damage in the event of an obstruction or jamming in the loading of the staples. The upper cam disc 82 is fast upon the vertical shaft 80 or 81 and the lower cam disc 83 is journalled freely upon said shaft and carries a fixed projecting slide-actuating pin 84 whose outer end is confined, by adjustable set screw 85, in a slot 86 in the projecting central limb part 87 of the T-sectioned bar of the feed slide 72.

The two cam discs 82 and 83 are in face-to-face contact. The upper face of the lower disc 83 has an arcuate recess 88 (see FIGURE 7) housing a compression spring 89 which is engaged by a depending pin 90 fixed to the upper disc 82 so as to couple together the two discs, the spring-loading being such that the freely-journaled disc 83 will normally move angularly together with the fast disc 82 on oscillation of the shaft 80 or 81 and thereby cause the slide 72 to be reciprocated in the guideway 73 and to effect the loading of a staple into the carrier arm holder 12. In the event of an obstruction causing an increased resistance, however, the spring loading will be overcome and the fast disc 82 will move relatively to the freely-journalled disc 83 and no feed or loading will take place.

The lower ends of the vertical shafts 80 and 81 are journalled in inwardly-projecting integral brackets 92 of the adjacent side wall 17 of the base frame, and the oscillatory movement of the shaft is positively controlled by the cams 25 and 26 which have profiled grooves engaged by cam follower pins 93 on arms 94 fixed to said shafts 80 and 81.

The continuous feeding device by which the staples 1 are supplied to the delivery channel 76 forms no part of the present invention, and any suitable device designed to provide a feed flow of the workpieces under a slight feed pressure may be employed. Although this may be a magazine type of device, another form of device which has been found satisfactory utilizes a vibrator drum, that is, a hollow drum having a base part which is vibrated through electro-magnetic means so as to impart a unidirectional movement about the vertical axis of the drum to small objects placed thereon. The movement of the objects is constrained by the upstanding side wall of the drum and such devices are well known for use in sorting and feeding small objects, such as nuts and bolts for example.

Although not fully illustrated, a part of such a vibrator drum is shown in FIGURE 5 and it may be useful to outline briefly the manner in which the device may be adapted for feeding the pronged staples at the present case. Around the interior surface of the drum side wall 96, a pair of spiral guide tracks or ramps 97 are provided which lead upwards from the vibrating base 98 to the upper periphery, these tracks or ramps 97 being of gradually decreasing width at the lower end (not shown). Staples placed in the drum then automatically arrange themselves around the side wall 96 and become fed upwards along the inclined guide tracks 97 under a light forwards pressure. In so doing, the staples become correctly orientated in line, with their prongs 2 presented upwards, although any staples which do not orientate themselves, by reason of a dimensional defect or otherwise, will normally be displaced and will fall back to the base of the drum before they reach the top of the tracks 97. At the top outlet end, the width of the tracks or ramps is substantially the same width as the bar 3 of the staples, and a gate (not shown) formed by a projection or guard may be positioned above each of the tracks or ramps 97 finally to ensure that no staples are passed on which are not correctly orientated.

The top outlet ends of the tracks or ramps 97 may be joined to the delivery channels 76, 76, of the press by separate connecting bridge channels 99 along which the end-to-end line of staples is fed. In normal use, it will be understood that the actual forwards movement of the staples is only intermittent, occurring after each loading of the carrier arm 10 when the guideways 73 of the loading means are cleared. The staples in the feed delivery channels 76, however, are under a continuous light forwards feeding pressure between each forwards movement.

The mandrel 7 consists in an elongated blade-like bar which is rigidly mounted at its inner end on a fixed block 101 forming a frame member of the apparatus. As illustrated particularly in FIG. 6, the mandrel is mounted in the manner of a cantilever so as to extend laterally across and slightly above a block 100 at the front of the machine on the flat top surface 16 of the frame 15, and the anvils 8, 8, are spaced apart along the outer free end portion of the mandrel bar 7 which is of a suitable size as to permit insertion into the garment waistband 6. Each anvil recess 8 is a shallow depression in the top surface of the mandrel bar 7, corresponding in size and shape to the dimensions of the back-plates 5 so that one back-plate will seat therein and lie flush with the top surface of the mandrel bar 7, portions of the base of the anvil recess being deepened to provide inclined or curved prong-clenching surfaces for engaging and folding over the prongs 2 of the staples 1.

The outer end portion of the mandrel bar is normally spaced above the block 100, but it is arranged to be supported from beneath in the regions of the anvils 8, 8, during the clenching operation by a pair of vertically movable supporting members 102, 102, which are raised into supporting engagement. These supporting members are mounted in vertical guideways 103 in the block 100 and are formed with inclined cam surfaces 104 at their lower ends which co-operate with cam surfaces 108 of operating slide members 105 coupled to the lever and linkage system controlling the carrier arm by means of slots 106 engaged by pins 107 on the levers 54. The supporting members 102, 102, are thereby caused to be raised automatically in timed relation with each clenching operation in order to place the mandrel 7 in an operative condition at the correct stage.

For mechanically loading each of the anvils 8, 8, with a back-plate 5 between each clenching operation, the mandrel has mounted thereon a sliding loading member 110 which transports the back-plates along the mandrel, two at a time, from a feed station disposed adjacent the inner fixed end and deposits them individually in the said anvil recesses.

This loading member 110 comprises a saddle plate 111 having a channel 112 in its underside which fits over the mandrel bar 7, a central window aperture 113 in the plate 111 being shaped to receive and contain at least two of the back-plates 5 superimposed one on top of the other and seating upon the top surface of the mandrel and forms a cage component (see FIG. 9). The loading member 110 is retained in position by a cross member 114 spanning the underside of the mandrel bar 7 and a spring-loaded ball 115 is provided to take up free play. A two-armed lever 117 is also pivotally mounted on a bracket 118 carried at the rear end of the carrier member plate 111, this lever 117 being spring-loaded so that the front arm 119 is pressed downwardly into the window aperture 113 and exerts a downwards pressure upon back-plates 5 contained therein whilst the other, second arm 120 projects rearwardly and upwardly.

The loading member 110 is connected by means of a rod 122 to a rack 123 in engagement with a pinion 124 driven, through gearing 125 and a slip clutch 126, by a reversible electric motor 128 whereby said member can be reciprocated along the length of the mandrel. In

its normal position, however, as shown in the drawings, it lies adjacent the inner fixed end of the mandrel opposite to the end of a feed channel **129** along which the back-plates **5** are supplied from the storage magazine **11**, and the rearwardly-directed arm **120** of the spring-loaded lever **117** is depressed by engagement with a fixed cam member **132** so that the other arm **119** is raised leaving the central aperture **113** unobstructed for receiving the back-plates.

The back-plates **5** are moved along the feed channel **129** in pairs, superimposed one on the other, as hereinafter described, whilst the carrier member **110** is in its above-mentioned normal position, and it is arranged for each pair of back-plates to drop into the central window aperture **113** as it emerges from the end of the feed channel **129**. The loading member **110** is then caused to move along the length of the mandrel **7** by energisation of the motor **128** driving the rack pinion **124**, and the back-plates are successively automatically deposited in the two anvil recesses **8**, **8**, as the loading member **110** passes over them, under the influence of the spring-loaded lever **117**. When the loading member has passed over the outermost anvil **8** and is approaching the free end of the mandrel **7**, the rack pinion drive motor **128** is stopped, and then reversed so that the loading member is returned to its original position ready to await reloading after the clenching operation has taken place.

The back-plates **5** are supplied to the feed channel by a gravity feed from the magazine **11** which is in the form of a hollow vertical open-ended column in which the back-plates are stacked. The back-plates drop directly from the lower end of the magazine into the feed channel **129** which is formed by a shallow groove, of the same width as the back-plates, in the top face of a rectangular-sectioned feed channel bar **134** which extends from a point to the rear of the storage magazine forwardly to the mandrel feed station (see FIGURE 9).

The back-plates are moved forward in the feed channel **129** by a reciprocatable feed slide **135** which is under the basic control of the common camshaft **14** of the machine. This feed slide **135** is operatively connected through the levers **137** and **138** to the oscillatory vertical shaft **80** which operates one of the sets of loading mechanism for the pronged workpieces so that the loading of the workpieces and the feed of the back-plates are synchronised.

The feed slide **135** is slidably fitted in the rear part of the feed channel **129** behind the storage magazine **130** and its depth corresponds to the thickness of a pair of the back-plates superimposed one on top of the other, so that the back-plates are thereby moved forwards in superimposed pairs.

The two levers **137** and **138** are coupled together through a safety overload arrangement which yields resiliently in the event of an obstruction, this arrangement comprising a plate **140** which is secured to the lever **137** and which is connected to lever **138** through a pivot connection **141** and a pair of springs **142**.

The main camshaft **14** of the machine, which provides the basic control for the cycle of operations comprising the loading of the workpiece holders **12**, **12**, setting of the mandrel **7** by causing the supporting members **102**, **102**, to be raised and bringing the loaded workpiece holders **12**, **12**, and the mandrel into co-operative engagement, in predetermined sequence, is conveniently powered from a main drive electric motor (not shown) through a pulley **144** which is coupled to the camshaft through a solenoid-controlled clutch **145**.

The operation of loading the mandrel with the back-plates **5** is conveniently controllable by an operator independently of the clenching cycle of operations of the apparatus although preferably interlocking means are provided so as to ensure that normally, loading of the mandrel and the clenching cycle of operations are carried out alternately.

Thus, referring to the exemplary simplified circuit diagram of FIGURE 11, the operation of loading the mandrel is initiated by operating the control push-button switch **S2** which energises a hold coil HC closing a switch **S4** of an associated hold circuit, sets a timing device T, closes limit switch **S6** through reset coil **RC2**, and energises relay R which operates switch **S7** to energise the rack pinion drive motor **128** to run in a forward direction and move the back-plate carrier **110** along the mandrel.

The energisation of relay R and operation of switch **S7** also energises the brake solenoid coil BC of a solenoid **148** which releases a brake shoe **149** which is normally applied by a spring **150** to the shaft of motor **128**, the mechanical arrangement being shown most clearly in FIGURE 10.

When the back-plate carrier **110** moves away from its initial position at the feed station, the return limit switch **S8** closes, and after a predetermined angular movement of the clutch **126** sufficient for the carrier **110** to reach the outer end of the mandrel, a forward limit switch **S9** associated therewith is opened to stop the motor **128**. After a predetermined time interval, the timing device T opens switch **S5**, thereby de-energising relay R and returning switch **S7** to its initial position in which the circuit is completed through switch **S8** to energise motor **128** to run in the reverse direction and return the carrier **110** to its initial position at the feed station, the return limit switch **S8** then being re-opened, and limit switch **S9** re-closes.

The clenching cycle of operations can then be carried out by operating the control push buttons of switch **S3** which, as a safety precaution, are spaced apart so that the operator has to use both hands for this purpose. The solenoid coil CS of the main camshaft clutch **145** is then energised so that the camshaft **14** receives drive from the continuously-running main drive motor M. Also, reset coil **RC1** is energised to re-close switch **S5** for the next mandrel loading operation.

After the completion of one revolution of the camshaft **14**, which is sufficient to complete the clenching cycle of operations, the limit switch **S6** is opened automatically to de-energise clutch solenoid coil CS.

Clenching presses in accordance with this invention may be similarly designed for attaching pronged garment hook fasteners. For example, the press described may readily be adapted for attaching pronged sheet-metal hook fasteners of the kind illustrated in FIGURE 12 which comprise a hook tongue **152** joined by a cranked part **153** to a short integral base plate **154** provided with a pair of prongs **155** along each side edge. An associated backing plate **156** may be substantially rectangular with a pair of elongated slots **157** toward a ribbed end portion thereof for receiving the prongs **155**.

The main modifications in the press described which may be required for accommodating this hook device concern dimensional alterations to the delivery feed channels **76**, the backing plate feed members, and the anvils **8**, **8**. Also, the delivery feed channels **76** may require the addition of a top retaining plate to overlie the tongue portions **152** of the hooks therein.

If desired, presses in accordance with this invention may, of course, also be designed to effect the attachment of only one pronged workpiece at each operation.

It will be clearly understood that the foregoing particular apparatus and arrangement of controls has been described only by way of example of how the invention may be carried out, and numerous modifications may be made within the scope of this invention.

In a further possible modification of the means for loading the mandrel, the mandrel may be movably mounted and arranged to be passed directly beneath a feeding and loading device. Thus, as illustrated diagrammatically in FIGURE 13, the apparatus already described may be modified insofar as the mandrel, here denoted by the reference *7a*, is slidably mounted and is connected directly to

a rack member **123***a* whereby it can be reciprocated by a reversible rack pinion motor **128***a*, and the back-plate storage magazine, here denoted by the reference **11***a*, is positioned directly over the mandrel so that the back-plates are deposited directly in the anvil recesses **8***a*, **8***a*, when the mandrel is retracted.

In modifications concerned with the mounting and setting operation of the mandrel, instead of a fixed cantilever type mandrel being provided in association with a movable supporting member or members, a fixed or stationary supporting member may be provided in association with a movably-mounted mandrel of which the operation is again mechanically controlled in sequence with the other steps of the cycle of operations of the apparatus.

Thus, in an arrangement similar to that indicated in FIGURE 13 in connection with the back-plate loading means, the mandrel may be slidably mounted and arranged, by means of a rack and pinion gear for example, to be displaceable between an operative clenching position in which its outer end is located above a fixed or stationary supporting member and an inoperative position in which its outer end is free and unsupported projecting forwardly beyond the said supporting member so as to facilitate insertion into the pocket or sleeve portion of the garment. In this case, however, the rack and pinion drive motor will be energised automatically in sequence with the clenching cycle of the apparatus, as by means of a switch operated from the main camshaft, in order to set the mandrel in its operative clenching condition immediately prior to each clenching operation.

In a further arrangement, illustrated diagrammatically in FIGURE 14, the apparatus hereinbefore described is modified in that the mandrel, here denoted by the reference **7***b*, consists in an elongated anvil-carrying bar which is hinged or pivotally mounted towards its inner end, at **160**, for movement in a vertical place, and is actuated by a vertically-movable plunger **161** under the mechanical control of a cam **162** on the main camshaft **14***b* and is associated with a fixed stationary supporting part **100***b* under its outer end portion. With this arrangement, the plunger **161** is arranged normally to maintain the mandrel **7***b* in a raised position above the said supporting part **100***b* to facilitate the insertion into the pocket or sleeve part, and the mandrel is subsequently brought into its operative condition immediately prior to the clenching operation by lowering of the plunger **161** so that the mandrel bar, fitted with the pocket or sleeve part, then drops until its outer end portion rests up on the fixed supporting part **161**.

In another alternative modification, illustrated diagrammatically in FIGURE 15, the mandrel **7***c*, may consist in an elongated anvil-carrying bar which is pivoted on a vertical pivot shaft **164** for angular movement in a horizontal plane, so that it can be moved between an operative position in which its outer end rests on a fixed stationary supporting part **100***c* and a normal inoperative position in which its outer end is unsupported directly and is free to be inserted into the pocket or sleeve, the movement of the mandrel **7***c* again being under the control of the main camshaft **14***c* through a mechanical interconnection such as a lever arm and follower **165** cooperating with a grooved cam **166**. With this arrangement, the mandrel may be precisely located, particularly in its operative position, by additional, appropriate, stops if necessary.

For simplicity, no means for mechanically loading the mandrel with back-plates has been indicated in the above two alternative modifications, and although back-plate loading means already mentioned could be adapted to suit these arrangements, in fact, such means need not be provided in all cases, if not required, especially as the invention also comprehends apparatus intended for attaching pronged fastening devices which are not necessarily used in conjunction with complementary back-plates.

As an alternative to the steps in each cycle of operations being controlled by direct mechanical means, other means of interdependent control may be employed. For example, if desired the different operational steps comprising basically the loading of the workpieces, the bringing of the mandrel into its operative condition, and the relative approach movement between the mandrel and the work-holding part, may be controlled by separate electric motors which are themselves controlled by interlocking switches or the like so as to be operative in correct predetermined sequence.

I claim:

1. Clenching apparatus for attaching pronged workpieces, such as hooks and eye fastening devices, to a made-up pocket portion of a garment, such as a trousers' waistband, said apparatus comprising, in combination, prong-clenching anvil means, a horizontally-extending fixed cantilever mandrel having the form of an elongated blade-like bar, said mandrel carrying said anvil means and being insertable into said pocket portion of the garment, a slidably-mounted movable supporting member settable in an operative position in supporting engagement with the underside of the outer end of the mandrel bar and in an alternative inoperative retracted position, an operating slide member having cooperating cam surfaces engaging said supporting member and controlling movement of the latter between said operative and inoperative positions, holder means for the pronged workpieces, a movable carrier member supporting said holder means, loading mechanism for mechanically loading the workpiece holder means automatically from a supply of the pronged workpieces, operating mechanism coupled to said carrier member for moving said workpiece holder means and the mandrel into cooperative clenching engagement to effect attachment of the pronged workpieces after said holder means has been loaded, said operating mechanism also being coupled to said operating slide member which controls the mandrel supporting member so as to actuate said slide member and set the mandrel supporting member in said operative position prior to the clenching engagement, and control means for controlling, in predetermined sequence, the steps of loading the workpiece holder means, actuating said operating mechanism to move the mandrel supporting member from said inoperative retracted position to said operative supporting position and to carry out the clenching operation in which the loaded workpiece holder means supported by the movable carrier member and the mandrel bar are brought into cooperative clenching engagement, and to return the mandrel supporting member to its retracted position.

2. Clenching apparatus for attaching pronged workpieces, such as hook and eye fastening devices for wearing apparel, to a made-up pocket portion of a garment, such as a trousers' waistband, said apparatus comprising, in combination, a frame, a mandrel having the form of a horizontally-extending elongated blade-like bar which is mounted towards its inner end on said frame and which is insertable into said pocket portion of the garment, a prong-clenching anvil and back-plate locating recess carried by said mandrel, a supporting part associated with said mandrel which supports, from beneath, the outer end portion of the mandrel after insertion into said fabric pocket, means for effecting relative movement between said mandrel and said supporting part, whereby said mandrel is selectively settable in an operative supported clenching condition, or in an inoperative freely-projecting condition which facilitates insertion into said garment pocket portion, holder means for said pronged workpieces, operating mechanism for bringing said holder means and the mandrel, in its operative condition, into cooperative clenching engagement to effect the attachment operation, and means for mechanically loading the mandrel with back-plates in located position between each clenching operation, said back-plate loading means in-

cluding a loading member which is normally disposed adjacent the inner end of the mandrel and which has an open cage compartment for receiving and retaining the back-plates in cooperation with the upper surface of said mandrel, said upper surface lying directly beneath and extending across the open lower end of said cage compartment so as to form a seating surface for back-plates contained within said cage compartment, and means for effecting a relative reciprocatory movement between the mandrel and said loading member so as to bring said cage compartment above the anvil and back-plate locating recess and thereby cause a back-plate contained in the cage compartment to be deposited, through said open lower end of the latter, into said anvil and back-plate locating recess.

3. Clenching apparatus according to claim 2, wherein the back-plate loading member is slidably mounted on the mandrel and reciprocates along the length of the mandrel, during the loading operation, from a feed station toward the inner end of the mandrel, said loading member extending across the upper surface of the mandrel and having a window aperture therein which forms said cage compartment.

4. Clenching apparatus according to claim 3, which is designed to attach a pair of pronged workpieces simultaneously, wherein a pair of spaced anvil and back plate locating recesses is carried by the mandrel bar and the cage compartment of the back-plate loading member has a depth sufficient to contain a pair of back-plates superimposed one upon the other.

5. Clenching apparatus according to claim 3, further comprising a storage magazine for said back-plates, a feed channel extending from said storage magazine to the loading member feed station toward the inner end of the mandrel, and a feed slide and actuating mechanism for reciprocating said feed slide to cause the back-plates to be fed along said feed channel from the storage magazine, the outlet end of said feed channel being positioned to deposit the back-plates emerging therefrom directly into the cage compartment of the back-plate loading member.

References Cited by the Examiner

FOREIGN PATENTS

634,893 9/1936 Germany.

GRANVILLE Y. CUSTER, JR., *Primary Examiner.*