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FASTENER DRIVING AND DIMPLING TOOL

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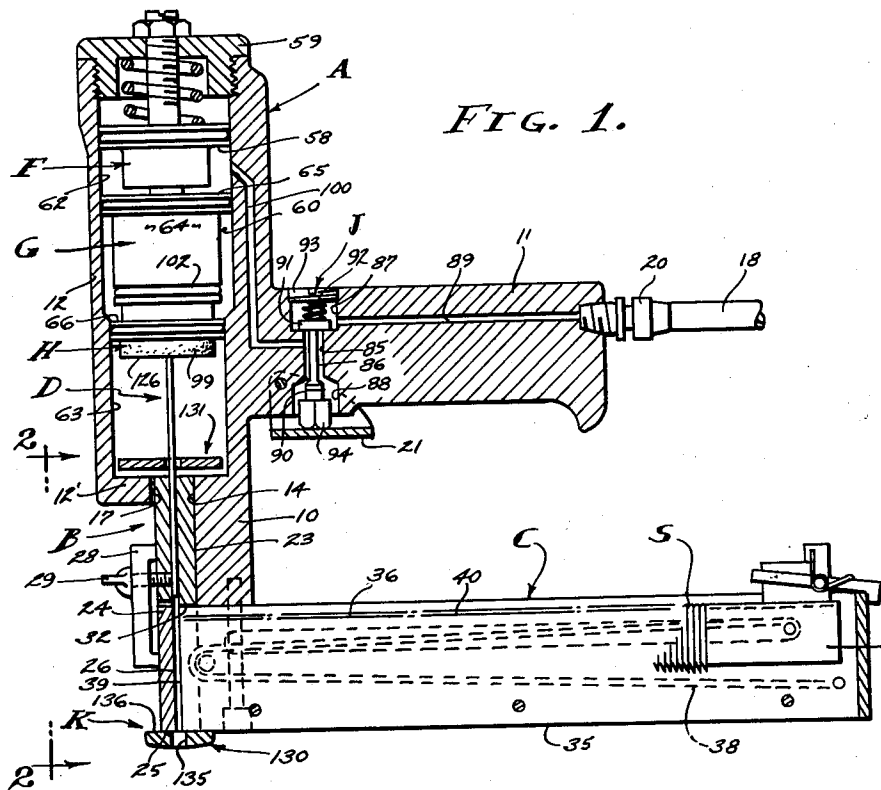


FIG. 1.

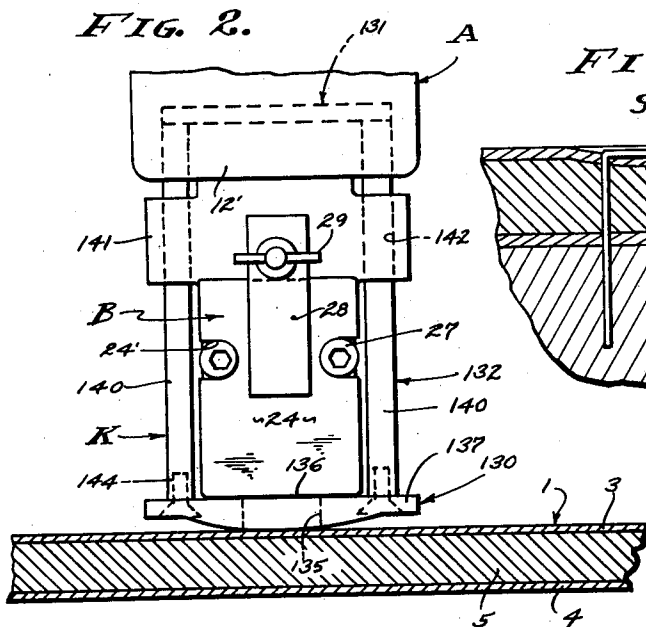


FIG. 2.

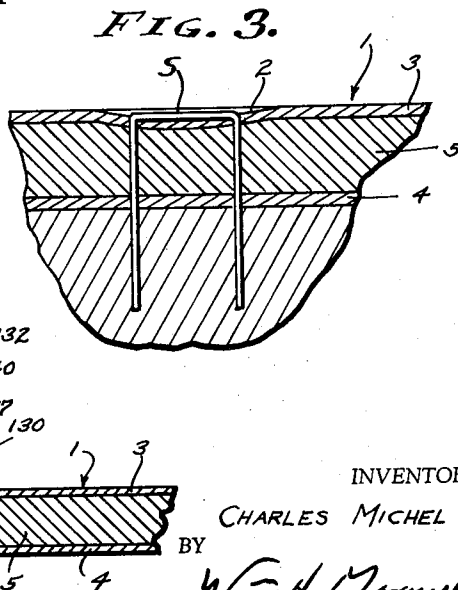


FIG. 3.

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FASTENER DRIVING AND DIMPLING TOOL

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This invention relates to a fastener driving tool and is particularly concerned with a tool that drives fasteners and simultaneously dimples or makes an impression in the surface or part to which the fastener is applied, it being a general object of this invention to provide a simple and practical dimpling mechanism that is operated by the fastener driving mechanism of the tool and which dimples or makes an impression in an exact and predetermined manner.

Fastener driving tools are widely employed in the process of manufacture in order to secure parts together, by reciprocation of a driver blade that engages the fasteners to force them into the parts to be secured together. Such tools are pneumatically powered and commonly involve cylinder and piston type drive mechanisms operatively connected to the driver blade and under control of a manually operable valve, or trigger control.

The function of these driving tools is to strike the fastener with a blow of sufficient force to bury the fastener in the parts being secured, this function being accomplished in one cycle of operation or in one stroke. Since the parts to be secured together are varied in density and resistance to penetration by the fastener, the tools are controllable as to driving force applied and to the end that a fastener can be struck by the exact force desired, all as circumstances require.

The present invention is particularly concerned with the securing of gypsum-board to framework, which process of manufacture is carried out in the construction of the walls of buildings. More particularly, the present invention is concerned with "dry-wall" construction wherein the gypsum-board per se forms the finished wall surfaces and wherein the joints between adjacent panels thereof are taped and cemented. The panels of gypsum-board in said "dry-wall" construction involves a body of gypsum cured between opposite layers of paper and said panels are manufactured with recessed margins adapted to receive and accommodate a tape that is applied with a cement, the cement being troweled flush with the plane of the outside surface of the wall. Further, intermediate fasteners are applied between the said margins of the gypsum-board and it is necessary to recess the head portions of these intermediate fasteners and to bury them in cement, the said cement being troweled flush with the plane of the outside surface of the wall, the same as at the joints or seams between adjacent panels.

Heretofore, fasteners such as nails have been hammered into and through the gypsum-board, the hammer being manipulated to create a dimple that recesses the head of the nail. Also, when fasteners are driven by means of a pneumatic tool, as above referred to, the fasteners such as U shaped staples are driven into and through the gypsum-board, and the tool being adjusted to bury the head portion of the staple beneath the surface of the gypsum-board. In both of these two instances, the surface of the gypsum-board is almost always or usually fractured and damaged, in the first case by the indentation made by the hammer head, and the second case by the cutting of the head portion through the top surface of the gypsum-board. That is, hammer marks and buried staple heads damage the paper surfacing of the gypsum-board by fracturing the paper layer and

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also damaging the body of the gypsum-board by over-compression and crushing of the gypsum core. As a result, application of fasteners by the usual and ordinary methods is unsatisfactory and results in a weakened condition at each fastener that is applied through the gypsum-board, said strength of the gypsum-board residing in the two layers of encasing paper.

It is an object of this invention to provide a fastener driving and dimpling tool that simultaneously drives a fastener and forms a dimple or recess in the surface or part through which the fastener is applied. With the tool and mechanism herein disclosed, a fastener is driven in the usual manner at which time a dimple or recess is formed surrounding said fastener, all without fracturing of the surfacing of the surface or part.

It is another object of this invention to provide a cylinder and piston type fastener driving tool wherein reciprocation of the operating elements thereof actuates a dimpling or recessing mechanism that acts upon the surface of the parts through which a fastener is applied. This invention provides for co-action of the usual driving mechanism with a dimpling means, so that the fastener is driven and surrounded by a recess, all in one cycle or stroke of the tool.

Further, it is an object of this invention to provide a dimpling or recessing means that is applicable to the usual cylinder and piston operated fastener driving tool, and which is energized by inertia stored in the moving parts of said tool when said tool is operated. With the dimpling or recessing means herein provided the energy for operating the dimpling means is received from the moving piston and related parts during the arresting thereof at the end of the work stroke.

Also, it is an object of this invention to provide a head construction in a fastener driving tool of the type under consideration wherein the fasteners are easily accessible for cleaning of jams and wherein the combination of the dimpling means does not interfere with accessibility for said cleaning of jams.

The various objects and features of this invention will be fully understood from the following detailed description of a typical and preferred form and application thereof, throughout which description reference is made to the accompanying drawings in which:

FIG. 1 is a side sectional view of a fastener driving tool incorporating the dimpling mechanism of the present invention. FIG. 2 is an enlarged detailed front elevation of a portion of the tool and taken as indicated by line 2—2 on FIG. 1. FIG. 3 is an enlarged detailed sectional view showing the manner in which a fastener is applied to and a dimple formed in the work involved. FIGS. 4 and 5 are enlarged detailed sectional views, FIG. 4 showing the moving parts of the tool in an up position and FIG. 5 showing the said parts in a down or driving position, and FIG. 6 is a transverse sectional view taken as indicated by line 6—6 on FIG. 4.

The fastener driving and dimpling tool of the present invention is a pneumatic or air operated tool or fastener driving device adapted to drive U-shaped staples, it being understood that any type or configuration of fastener can be driven thereby, as required. However, as is shown, an acceptable fastener for use in securing "dry-wall" gypsum-board to a framework is a U-shaped staple made of a body having a rectangular cross section to have flat engagement with the top surface of the gypsum-board. As shown in FIG. 3, the staple S is driven below the top surface of the gypsum-board 1 to be accommodated in a dimple or recess 2 formed in the top paper layer 3. The said gypsum-board 1 includes top and bottom layers 3 and 4 of paper or the like that encase a core 5 of gypsum, the three elements 3, 4 and 5 being pressed to-

gether and cured in the presence of heat forming a panel of uniform thickness and character.

The tool, as illustrated in the drawings, is adapted to be handled manually and involves, generally, a frame A having a body portion 10 and a handle or grip portion 11, a head B carried by the frame A and adapted to direct fasteners into a piece of work, a magazine C for handling a supply of fasteners such as staples and co-operating with the head B so that the staples are received and handled by the head, a driver blade D, a latching means F adapted to cooperate with and control operation of the driver blade D, a piston G operable in a cylinder 12 in the frame A and adapted to drive the blade D, a coupler H operatively joining the driver blade D and piston G, valve means J adapted to control the supply of fluid under pressure to actuate the piston G through a work stroke and a return stroke, and a dimpling means K adapted to be operated by movement of the piston G and related parts to recess the gypsum-board 1, as shown at 2.

The frame A carries the various elements of the tool, and is shaped to be conveniently handled by a person. The frame A involves, generally, the body portion 10 and the handle or grip portion 11. The body portion 10 is a simple elongate part having a cylinder 12 extending longitudinally thereof and having an opening or passage 17 extending longitudinally through the head thereof, at the lower end of the cylinder 12, and has a recess 14 at the opening 17 for receiving and positioning the head B.

The handle or grip portion 11 is provided to give the person handling the tool a convenient means to hold the tool and is a simple grip of ordinary construction that projects from the body 10. In practice, the grip 11 may be substantially normal to the axis of the body and may project therefrom as clearly shown in FIG. 1 of the drawings.

In structures of the type under consideration, it is common practice to provide a fluid pressure supply connection 18 at the grip 11, such as a pneumatic means at the grip 11. It is to be understood that any suitable fluid pressure supply can be provided without affecting the present invention. In the case illustrated the hose of the power connection 18 is attached to the grip 11 through a quick disconnect 20 and the valve means J is under control of a finger operated trigger 21.

The head B is, in effect, an extension of the body 10 of the frame A and is provided to receive and deliver fasteners such as staples to the work being acted upon by the tool. The head B is carried by the body in the recess 14 and is provided with a longitudinal guideway 22 that extends through and opens at the ends of the head B. The head B has a face 23 engaged with the recess 14 and it has an end face 25.

In the particular form of the invention shown, the guideway 22 is adapted to handle fasteners or staples S that are U-shaped having a pair of sharpened ends (see FIG. 3). The staples referred to are substantially elongate with straight parallel shanks joined by a straight transverse head portion. It will be apparent how the guideway 22 can be proportioned so that it will readily pass the staples with clearance and will act upon the staples to guide them as they are delivered through the head B and from the tool. The guideway 22 guides the driver blade D of the tool as well as the staples S that are handled thereby.

In accordance with the invention, the guideway 22 in the head B is closed by a removable plate 24 secured to the side of the head at the front of the tool. In the case illustrated, the head B is provided with a recessed face 26 in a plane coincidental with the outer face of the blade D and positioned to locate the plate 24 to form the fourth enclosing wall of said guideway. Spaced fasteners 27, one at each side of the head, secure the head to the body portion 10 of the tool, said fasteners having heads that establish lugs for locating the plate 24. There-

fore, the plate 24 is provided with notches 24' at opposite sides to receive the heads of the fasteners 27, whereby the plate 24 is keyed in working position. In order to secure the plate 24 in said working position, a keeper 28 is provided, said keeper being in the form of a bar that spans between the upper portion of the head B and plate 24. The side faces of the head B and plate 24 are coplanar and the keeper 28 is held in place by a screw fastener in the form of a wing screw 29 or the like, as shown. It will be apparent that the keeper 28 when tightened in place will secure the plate 24 in working position, and that when the plate is removed the guideway is completely opened for clearing of jams.

A fastener or staple receiving opening 32 extends laterally through the head B, which opening enters the face 23 of the head and opens into the passage 22 so that the staples S fed to the head B are properly guided and aligned with the passage 22 before they are engaged by the driver blade D of the mechanism.

The magazine C is adapted to handle a supply or stack of fasteners or U-shaped staples S and involves, generally, a case 35 carried by the frame A, a guide 36 within the case 35, a follower 37 adapted to advance the fasteners or staples, and a feed spring 38 yieldingly urging the follower toward the head B. The case 35 is carried by the body 10 and is an elongate part that projects laterally therefrom. The case is shell-like in form and the guide 36 in a core-like part that is coextensive with the case 35 and is carried between the side walls thereof. A longitudinal passage 40 is formed by the case 35 which passage conforms in general configuration to the U-shaped staples S which are handled by the head.

The guide 36 enters the fastener or staple receiving opening 32 and terminates in a flat end 39 that occurs in the plane of the bottom wall of the guideway 22. The follower 37 conforms with the configurations of and is slidably carried in the passage 40 and is yieldingly urged toward the head B by the feed spring 38. Means is provided to prevent the follower 37 from entering the guideway 22. The fasteners or staples S are inserted into the magazine C through the open top thereof by simply engaging them over the guide 36 ahead of the follower 37 tensioning the spring 38. As clearly shown in FIG. 1, a spring biased latch secures the follower 37 in a retracted position when desired, thus facilitating insertion of the fasteners.

The driver blade D is essentially a slender elongate part rectangular in cross sectional configuration and terminates at its forward end in a flat fastener or staple driving face 45. The blade D occupies the guideway 22 of the head B and has an upper driven portion which couples to a head 46 to have driving engagement with the piston G.

The latching means F that may be employed in tools of the type under consideration is adapted to cooperate with and control operation of the piston G, later described. The means F is provided to couple with and to hold the piston G at the upper end of the cylinder 12 and to release the piston G when sufficient fluid pressure has been established in the cylinder to effect the desired work stroke. The latching means F may involve suitable mechanism to carry out the function referred to without affecting the present invention. For example, the latching means F may involve means adapted to releasably couple to a head 57 that projects from the top of the piston G, and a pressure responsive release means 58 adapted to release the head 57 from the upper end of the cylinder 12. The upper end of the cylinder 12 remote from the head B is closed by a cap 59, the latching means F being threadedly engaged through an opening in the cap for adjustment.

The piston G operates in the cylinder 12 and has driving engagement with the driver blade D. The piston G is adapted to drive or move the driver blade D forwardly or downwardly and is adapted to be damped or snubbed

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separately from the driver blade D. The cylinder 12 is incorporated in the body 10 of the frame A on the longitudinal axis thereof, and is supplied with fluid under pressure by the valve means J, as hereinafter described. The piston G is freely carried in the cylinder 12 and is actuated to retract and to advance in the cylinder. In the particular tool illustrated throughout the drawings the ordinary compression return spring is eliminated which is usually provided within the cylinder 12 ahead of the piston G to return the piston to a retracted position. The tool illustrated is operated entirely by fluid pressure so that when the trigger 21 of the tool is operated the piston G is moved to the bottom of the cylinder 12, and so that when the trigger 21 is released the piston G is moved to the top of the cylinder 12.

The piston G is light in weight, preferably made of magnesium, or the like, and is characterized by upper and lower portions of different diameter establishing a chamber 60 therebetween. The piston G occupies the interior of the cylinder 12 in which case the cylinder 12 is also characterized by upper and lower bores 62 and 63 of different diameters. The return means of the tool involves the provision of said differing diameters in connection with the cylinder 12 and piston G, and further involves the provision of a pressure supply in communication with the cylinder 12 between the upper and lower portions of the piston G. The pressure supply is a valve means that allows fluid to flow in one direction only and checks the flow of fluid in the other direction so that fluid pressure applied to the cylinder 12 above and piston G is directed to the chamber 60 and is retained in the chamber 60 by action of the valve of the pressure supply. As shown, the valve seat 100 is a circumferentially formed seat at the exterior of the piston G and formed in the intermediate cylindrical portion of the piston between the upper and lower portions thereof. The port 101, as shown, extends from the interior of the piston G in communication with the upper end thereof and opens at the seat 100. The valve element 102 is a circular element, preferably a band or the like, of elastic material. In the case illustrated, the valve element 102 is an elastic band of rubber that encircles the piston G and which is constricted onto the seat 100. As shown, the valve element 102 normally closes the port 101 so that external fluid pressure will not enter the piston G, but so that internal fluid pressure is free to pass into the chamber 60. In practice the band forming the valve element 102 is circular in cross section and in the form of an O ring sealing ring, and in which case the seat 100 is arcuate in form to cooperate with the inner diameter of the element 102. It will be apparent how the O ring shaped valve element 102 seals fluid under pressure in the chamber 60.

The piston G is a shell-like body 64 of material and has upper and lower piston heads 65 and 66 at the upper and lower portions respectively. The head 65 is slidably operable in the bore 62 of the cylinder 12. As shown, suitable sealing rings are provided at the two heads 65 and 66, and are preferably O ring type sealing rings carried in annular grooves provided in the peripheries of the heads, respectively. As shown, a turned portion 69 extends between the heads 65 and 66, preferably of a diameter slightly smaller than the lower head 66.

The valve means J is a fluid pressure supply and exhaust means that admits and exhausts operating fluid to and from the top end of the cylinder 12 hereinabove described. The valve means J is preferably formed in and carried by the frame A of the tool and, as shown, is housed in the grip 11. In the case illustrated, the valve means J involves a valve chest 85 formed or machined in the grip 11, and a slide 86 that is shiftably carried in the chest to control flow of fluid. As shown, the chest 85 extends through the grip 11 to open at both the front and back thereof, there being a recess 88 at the front of the chest. The recesses 87 and 88 are in the form of counterbores, the recess 87 handling the inlet of fluid

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under pressure and the recess 88 handling the exhaust of fluid. A pressure supply passage 89 connects the recess 87 to the connection 18 while the recess 88 simply opens to the outside atmosphere at the exterior of the grip 11.

The slide 86 of the valve means J is freely shiftable in the chest 85 and involves a plunger 90 that is operable in the recess 88 and a valve disc 91 that is operable in the recess 87. A spring 92 is seated in a cap 93 that confines the spring to the recess 87, the spring engaging and yieldingly urging the disc 91 into contact with a seat in the recess. An extension 94 projects from the plunger 90 and is engaged by and operated by the trigger 21. When the valve means J is depressed by the trigger 21 and disc 91 is lifted from the seat allowing passage of fluid under pressure to a passage 100 that is in communication with the upper end of the cylinder 12, while the plunger 90 enters the chest 85 to close the exhaust recess 88. When the valve means J is released to the position shown in FIG. 1 the disc 91 is seated to close the recess 87 while the plunger 90 opens the recess 88 to exhaust fluid from the upper end of the cylinder 12.

When fluid under pressure is applied to the upper end of the cylinder 12 the piston G moves downwardly and the chamber 60 is charged with fluid under pressure. Upon release of fluid from the upper end of the cylinder 12 the valve 102 of the means J operates to retain fluid under pressure in the chamber 60. The fluid that is employed to operate the piston G is air, or the like, which is elastic or compressible. The compressed fluid that is captured in the chamber 60 tends to expand and acts against the larger piston head 65 to move it upwardly to the position shown in FIGS. 1 and 4.

The coupler H universally couples the driver blade D and is free of the piston body 64 of the piston G. The head 46 is formed of a light weight material, for example, of aluminum or the like, and is carried within a recess 105 entering the lower end of the piston G and is positioned and guided therein by the coupler H, as hereinafter described. As shown, the recess 105 has a flat bottom in a plane normal to the central longitudinal axis of the piston G, and the recess 105 has a smooth cylindrical wall turned concentric with said axis. The head 46 has driving engagement with the piston body through the bottom of the recess 105 and has clearance with the flat bottom.

The head 46 is characterized by a radially projecting flange and by a center portion that is coupled to the driver blade D. The said flange forms a disc-shaped element that has a spherically shaped upper face 112 for engagement with the bottom of the recess and has a flat lower face 113 for engagement with the coupler H. The said center portion is in the form of a depending extension substantially smaller in diameter than the said flange and of substantial longitudinal extent, and it has centering engagement with the coupler H.

The said center portion of the head 46 is provided for coupling the driver blade D to the head 46 establishing a positive connection between these two elements so that they operate together as a unit. The driver blade D slidably enters a slot in the head 46 and a pin 117 is passed diametrically through the head and blade coupling the two elements together.

The coupler H of resilient or elastic material retains the head 46 within the recess 105 and centered with the piston G. Further, the coupler H holds the head 46 in working position relative to the bottom of the recess. The body 99 of material forming the coupler H has a central bore 120 extending therethrough to receive the said central portion of the head 46, and it has a flat top 121 adapted to have flat engagement with the bottom face 113 of the head. The outer diameter of the head 46 has frictional engagement with the bore 120, the coefficient of friction between the head 46 and bore being substantial due to the particular materials involved, as described.

The coupler H of resilient or elastic material is retained in the recess 105 and centered with the piston G. The

body 99 of material forming the coupler H is carried by the piston G and has a cylindrical outer wall 122 that is received within the recess 105 to have frictional engagement therewith. That is, the wall 122 has engagement with the cylindrical wall of the recess 105, the coefficient of friction between the body 99 and piston G being substantial due to the particular materials involved, as described.

The coupler H is characterized by its ability to arrest or damp the piston G and blade D independently of each other, and is characterized by a disc-shaped buffer portion that underlies the piston G and/or head 46, said buffer portion being a circular ring-shaped part having an outer peripheral portion underlying the bottom of the piston G, and/or an inner peripheral portion underlying the face 113 of the head 46. The said buffer portion has a bottom 126 engageable with the dimpling means K later described.

In accordance with the present invention there is provided the dimpling means K that is operated by the operation of the piston G and its related parts to recess the gypsum-board 1 at 2, as clearly shown in FIG. 3 of the drawings. The means K is energized by inertia stored in the moving parts of the tool, namely, the piston G and its related parts, when the said tool is operated by opening of the control means J as above set forth. More particularly, the means K is powered by arresting of said moving parts of the tool whereby the energy stored therein is utilized by arresting said parts through engagement with elements of said dimpling means. As best illustrated in FIGS. 4 and 5 of the drawings, the dimpling means K involves, generally, a shoe 130, an actuator 131, and means 132 operatively connecting the said shoe and said actuator. The shoe 130 is provided to engage the top surface of the gypsum-board 1 and is shiftable carried by the tool to reciprocate toward the work or gypsum-board when operated by the actuator 131. The actuator 131 is provided to be engaged by and moved or reciprocated by the piston G and related parts that are arrested through action of the compressible coupler H hereinabove described. And, the means 132 is provided to join the shoe 130 and actuator 131 so that movement or reciprocation of one is transferred to the other, respectively.

The shoe 130 that engages the work or the top surface of the gypsum-board 1 is a tool-like part shaped to form an impression of the desired configuration. It will be apparent that the exact form the shoe 130 can be varied, as desired, and in the drawings there is shown a typical flat and elongate shoe 130 disposed normal to the longitudinal axis of the tool and having an oval-shaped contour with curved exterior surfaces. In practice, the curvature is rather slight and extends a substantial distance laterally of the staple to encompass and surround the staple. Therefore, the shoe 130 has an aperture 135 extending therethrough and aligned with the staple driver blade D, to pass said blade with substantial clearance. As shown, the top 136 of the shoe is flat and is adapted to engage with the face 25 of the head of the tool. Further, the shoe 130 has oppositely laterally projecting ears 137 that extend from the sides of the head B to be coupled with the means 132 later described.

The actuator 131 is provided in accordance with the present invention and is positioned to be engaged by the piston G and compressible coupler H at the end of the work stroke that drives the staple S into the gypsum-board. In the preferred form of the invention, the actuator 131 is a plate-like element located in the cylinder bore 63 at the bottom 12' to be engageable with the compressible coupler H. In practice, the actuator 131 is a flat disc-shaped element disposed in a plane normal to the longitudinal axis of the tool and with an aperture 138 therethrough aligned with the staple driver blade D to pass said blade with substantial clearance. Also, the periphery 139 of the actuator 131 freely clears the bore

63 to the end that the said actuator can be shifted axially of the tool.

The means 132 that joins the shoe 130 to the actuator 131 is a guide means adapted to direct movement of the shoe 130 as well as to transfer movement of the actuator 131 to said shoe. The means 132 can vary and in the preferred form of the invention the said means comprises a pair of spaced and parallel operating rods 140 that are reciprocally guided by brackets 141, said rods being connected between said actuator and shoe. The rods 140 are elongate cylindrically shaped rods that are slidably carried in guide openings 142 in the brackets 141, said rods being of identical length and directed on axes spaced from the central axis of the tool and extending adjacent the sides of the head B. As clearly illustrated in FIGS. 4 and 5, the cylinder 12 is of larger diameter than the width of the head B, and there are spaced openings 143 in the bottom 12' of the cylinder and passing the rods 140. Thus, the rods 140 enter the cylinder bore 63 at diametrically opposite side walls thereof where they are engaged with the peripheral portions of the disc-shaped actuator 131. In the preferred form the top terminal ends of the rods 140 are threadedly engaged in the body of the actuator and the lower terminal ends thereof are secured to the top of the shoe 130 by suitable screw fasteners 144.

In accordance with the invention, the rods 140 space the shoe 130 and actuator 131 so that when the shoe is in a normal up position, as shown in FIG. 4, the actuator 131 is spaced somewhat from the bottom 121 of the cylinder 12 (see FIG. 4). Thus, the said actuator 131 is free to move and reciprocate downwardly with consequent movement and reciprocation of the shoe 130 before the bottom 121 stops the actuator 131. Driving force for operation of the dimpling means K is derived from the inertia in the moving piston G and its related parts, said force being transferred to the actuator 131 when the compressible coupler H engages the top of said actuator whereupon the body 99 of resilient material is compressed and arrests said moving parts.

From the foregoing it will be readily apparent that the driving force of the tool can be controlled so as to effect the driving of the staple S and dimpling or recessing of the gypsum-board 1. In the particular tool illustrated there is a self-returning cylinder and piston operating mechanism, there being an absence of return spring means, and the buffer or arresting means is carried by the piston per se. It is to be understood, however, that the dimpling means K of the present invention can be applied to any tool of the type under consideration, for example, a tool with a return spring for the piston G and/or with a buffer element at the lower end of the cylinder 12 and over the actuator 131. In any case, the inertial forces stored in the moving elements of the tool are transferred to the shoe 130, at the end of the work stroke, all to the end that a depression is made in the work, or gypsum-board, as the said moving elements are arrested.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims:

Having described my invention, I claim:

1. In combination with a fastener driving tool having a reciprocating driver, a dimpling mechanism including a reciprocable shoe carried by the tool independently of said driver, and resilient means carried by said driver to arrest movement of said driver at the end of a work stroke, said resilient means being located between said driver and said dimpling mechanism whereby said resilient means engages said dimpling mechanism upon movement of said driver during the work stroke of the tool to resiliently drive said shoe over the entire length of movement of said shoe.

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2. In combination with a fastener driving tool having a reciprocating driver, a reciprocable shoe carried by the tool independently of said driver, an actuator operatively coupled to said shoe, and resilient means carried by said driver to arrest movement of said driver at the end of the work stroke, said resilient means being located between said driver and said actuator whereby said resilient means engages said actuator upon movement of said driver during the work stroke of the tool to resiliently drive said actuator and shoe over the entire length of movement of said shoe.

3. In combination with a fastener driving tool having a reciprocating driver, a reciprocable shoe carried by the tool independently of said driver, a reciprocable actuator carried by the tool remote from said shoe, and resilient means carried by said driver to arrest movement of said driver at the end of a work stroke, said resilient means being located between said driver and said actuator whereby said resilient means engages said actuator upon movement of said driver during a work stroke of the tool to resiliently drive said actuator and shoe over the entire length of movement of said shoe.

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4. In combination, a cylinder and piston operated fastener driving tool having a head with a guideway there-through and a driver coupled to the piston and operable through said guideway, a reciprocable shoe having a convex face carried by the tool independently of said driver, an actuator operatively coupled to said shoe, and resilient means carried by said driver to arrest movement of said driver at the end of a work stroke, said resilient means being located between said driver and said actuator, whereby said resilient means engages said actuator upon movement of said driver during the work stroke of said tool to resiliently drive said actuator and shoe over the entire length of movement of said shoe.

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