A portable fastener driving device of the conventional pneumatic type having an improved actuating mechanism including an actuating member mounted for movement from a normal inoperative position into an operative position for initiating the movement of the fastener driving means through a fastener driving stroke, a contact trip mounted for movement from a normal inoperative position into an operative position in response to the movement of said device into cooperating engagement with a workpiece, a trigger mounted for manual movement from a normal inoperative position into an operative position and an enabling structure operatively associated with the actuating member, the trigger and the contact trip for (1) enabling movement of the trigger into its operative position when the contact trip is in its inoperative position without movement of the actuating member into its operative position, (2) enabling movement of the trigger into its operative position when the contact trip is in its operative position to effect movement of the actuating member into its operative position, and (3) enabling movement of the contact trip into its operative position when the trigger is in its operative position without movement of the actuating member into its operative position.
PORTABLE PNEUMATIC FASTENER DRIVING DEVICE WITH IMPROVED ACTUATING MECHANISM

This invention relates to portable pneumatic fastener driving tools and more particularly to improvements in the actuating mechanisms of such tools.

Since the early 1950's pneumatic fastener driving devices have become more and more accepted as an effective tool for accomplishing an ever increasing variety of fastener driving applications. One feature of these devices which contributes to their acceptability is that they are portable and capable of being operated while held in the hand of an operator. This feature of portability also gives rise to the possibility of inadvertent actuation resulting in the discharge of a fastener other than in the workpiece. In order to reduce this possibility, it has been common practice to build into the actuating mechanisms of such devices a so-called contact trip element in addition to the finger actuated trigger. The contact trip element is mounted on the device in a position adjacent the nozzle so as to normally extend outwardly beyond the discharge end of the fastener drive track. Thus, when the nozzle of the device is moved into engagement with the workpiece, the contact trip is moved from its normally inoperative position into an operative position.

In most instances, the work engaged movement of the contact trip into its operative position is utilized as an essential action along with finger actuation of the trigger into its operative position to achieve actuation with regard to the sequence in which the two movements are accomplished. This concomitant type of response is regarded to be particularly desirable in that it provides the operator with three different optional modes of operation, two of which are especially useful in high speed operations involving rapidly repetitive actuations. One mode of high speed actuation is the so-called "bump firing" mode where the operator keeps the trigger in its operative position by continuous digital pressure. By bumping the device along the workpiece a fastener is driven during each movement of the contact trip into its operative position with each successive contact of the device with the workpiece.

Another rapid repetitive mode of operation is the so-called "drag firing" mode in which the operator initially positions the tool into engagement with the workpiece without pressing the trigger, and then drags the tool along the workpiece in continuous contact with the workpiece so as to maintain the contact trip continuously in its operative position. By successively pressing and releasing the trigger a fastener is driven during each movement of the trigger into its operative position. A variation of this "drag" type of operation which makes possible an even more rapid repetitive actuation, is provided by the so-called autofire tools. Autofire operation involves the automatic recycling of the tool so long as the trigger remains pressed and the tool is moved along the workpiece in continuous contact therewith.

While all of these high speed modes of operation are desirable from a standpoint of increased productivity, they do require that the operator exercise care to avoid inadvertent or unwanted actuations of the tool. Perhaps the most common instance of inadvertent actuation occurs when an operator, holding a tool in his hand with the trigger pressed, inadvertently engages the contact trip with an object other than the intended workpiece, thus moving the contact trip into its operative position and actuating the tool. Another instance of inadvertent actuation can occur immediately following an intended actuation where the rebound incident to actuation is sufficient to move the tool off of the workpiece enough to reset the contact trip so that as the tool is moved back into contact with the workpiece a second unwanted actuation occurs resulting in a second fastener being driven sometimes right on top of the fastener initially driven. Where the fastener being driven is of a relatively large size, this double firing action can result in the first fastener preventing the second from properly entering the workpiece, thus presenting a potentially hazardous situation.

It is generally recognized that the chances of inadvertent actuation present in concomitant actuating mechanisms can be reduced by providing an actuating mechanism which requires the operator to sequentially move first the contact trip and then the trigger to accomplish actuation. Indeed, actuating mechanisms of this type appeared in the patented literature as far back as 1950 (e.g. Papalia U.S. Pat. No. 2,498,503 dated Feb. 21, 1950). The actuating mechanism of this type disclosed by Papalia, as well as those disclosed in the more recent unexpired patent art (e.g. U.S. Pat. Nos. 3,011,169; 3,056,964; 3,056,965; 3,198,412; 3,320,860 and 3,464,614) have all provided the sequential operation by releasably locking the trigger in its normal inoperative position against movement into its operative position by digital pressure alone and by utilizing the movement of the contact trip into its operative position to release or unlock the trigger.

While these prior art trigger lock-out mechanisms reduced the chances of inadvertent actuation to the extent that unwanted double firing is positively prevented, they do not positively prevent the more common type of accidental inadvertent actuation experienced with concomitant actuating mechanisms. As previously noted, these instances occur in situations where the operator is applying digital pressure to the trigger and the contact trip is inadvertently actuated by accident through engagement with a foreign object. With releasable trigger lock-out mechanisms, a similar accidental actuation can occur any time the operator is holding the tool and applying digital pressure to the locked out trigger. The only force (other than the normal spring bias of the contact trip) tending to prevent accidental actuation by engagement of the contact trip with a foreign object under these circumstances is the frictional resistance to the movement of the contact trip applied by the digital pressure on the trigger. In simple fact, it does not take much of a force acting on the contact trip to overcome this frictional force so that the only inadvertent actuations which are really prevented under these circumstances are those where the contact trip is only lightly engaged accidentally. Of equal importance is the fact that as these actuating mechanisms are used, the interengaging surfaces which effect the releasable locking function become worn in the direction of release, thereby reducing the frictional forces resisting contact trip movement when the trigger is under digital pressure. Moreover, in many of these mechanisms it becomes only a matter of time before this wear permits actuation to be accomplished by sufficient trigger pressure alone. When this condition is reached, the tool presents a safety hazard which is per-
haps greater than a comparable tool without any safety mechanism, in that unwanted actuation can now readily occur as a result of the malfunction of the actuating mechanism which the operator is relying upon to prevent such unwanted actuation.

An object of the present invention is to provide a pneumatic fastener driving device having an improved actuating mechanism which is operable to obtain all of the functional advantages of the prior art trigger lockout actuating mechanisms while eliminating the functional disadvantages thereof. In accordance with the principles of the present invention, this objective is obtained by providing the fasterner driving device with an improved actuating mechanism having an enabling means which is operatively associated with the contact trip, the trigger and the actuating member in such a way as to obtain the following functions: 1) movement of the trigger into its operative position when the contact trip is in its inoperative position without movement of the actuating member into its operative position; 2) movement of the trigger into its operative position when the contact trip is in its operative position to effect movement of the actuating member into its operative position; and 3) movement of the contact trip into its operative position when the trigger is in its operative position without movement of the actuating member into its operative position.

From the above, it can be seen that in accordance with the principles of the present invention the trigger is not releasably locked into its inoperative position but is moveable into its operative position at any time in response to the digital pressure of the operator. This movement of the trigger will effect movement of the actuating member into its operative position only when it is performed with the contact trip already in its operative position. On the other hand, when the trigger is being held in its operative position, movement of the contact trip into its operative position will not effect movement of the actuating member into its operative position. By virtue of these functions, the present actuating mechanism requires the same sequential movements in order to effect actuation as the aforesaid prior art trigger lock-out mechanisms. Moreover, since the movement of the contact trip into its operative position when the trigger is in its operative position does not effect actuation, the present mechanism, like the prior art trigger lock-out mechanisms, positively prevent double firing. This same function of the present mechanism, however, also positively prevents inadvertent firing by accidental engagement of the contact trip with a foreign object when the operator is holding the tool with digital pressure on the trigger, a capability which is not present in the prior art trigger lock-out mechanisms as aforesaid.

In accordance with the principles of the present invention, the preferred embodiment of the enabling means consists essentially of a single rigid structure which is pivotally connected either with the trigger, the contact trip or the actuating member and has suitable operative connections with the other two. Consequently, it is still another object of the present invention to provide a fastener driving device of the portable pneumatic type having an improved actuating mechanism which is simple in construction, effective in operation and economical to manufacture and maintain.

These and other objects of the present invention will become more apparent during the course of the following detailed description and appended claims.

The invention may best be understood with reference to the accompanying drawings wherein illustrative embodiments are shown.

In the drawings:

FIG. 1 is a side elevational view of a fastener driving device having an improved actuating mechanism embodying the principles of the present invention, the device being partly broken away for purposes of clearer illustration;

FIG. 2 is an enlarged fragmentary vertical sectional view illustrating the actuating mechanism of the present invention with the parts thereof in their normal inoperative positions;

FIG. 3 is a fragmentary sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is a view similar to FIG. 2 showing the position of the parts when the contact trip is in its operative position and the trigger is in the inoperative position;

FIG. 5 is a view similar to FIG. 2 showing the position of the parts when the contact trip has been initially moved into its operative position and the trigger has been subsequently moved into its operative position to effect movement of the actuating member into its operative position;

FIG. 6 is a view similar to FIG. 2 showing the position of the parts when the trigger has been initially moved into its operative position and the contact trip has been subsequently moved into its operative position;

FIG. 7 is a view similar to FIG. 2 showing the position of the parts in solid lines and in dotted lines after the contact trip has been moved toward its inoperative position a predetermined distance with the trigger maintained in its operative position;

FIG. 8 is a view similar to FIG. 7 of a modified form showing the position of the parts in solid lines and in dotted lines after the contact trip has been moved into its inoperative position and the trigger has been moved toward its inoperative position a predetermined distance;

FIG. 9 is a view similar to FIG. 7 of another modified form showing the position of the parts in solid lines and in dotted lines as the trigger member reaches its operative position with the contact trip maintained in its operative position;

FIGS. 10, 11, 12 and 13 are views similar to FIGS. 2, 4, 5 and 6 respectively, illustrating a modified form of actuating mechanism embodying the principles of the present invention;

FIGS. 14, 15, 16 and 17 are views similar to FIGS. 2, 4, 5 and 6 respectively illustrating another modified form of actuating mechanism embodying the principles of the present invention; and

FIG. 14A is a view of the actuating mechanism shown in FIGS. 14-17 illustrating the position of the parts after the trigger has been moved into its operative position with the contact trip maintained in its inoperative position.

Referring now more particularly to the drawings, there is shown in FIG. 1 thereof a portable pneumatic fastener driving device, generally indicated at 10, embodying the principles of the present invention. The device 10 shown may assume any conventional construction, however, the device 10 is particularly suitable for operation by an improved actuating mechanism, gener-
ally indicated at 12, embodying the principles of the present invention. The particular device 10, except for the actuating mechanism 12, is disclosed in detail in commonly assigned Burke application, Ser. No. 138,149, which issued Jan. 2, 1973 as U.S. Pat. No. 3,708,096, and commonly assigned Briggs application, Ser. No. 138,148, which issued Jan. 2, 1973 as U.S. Pat. No. 3,708,095. While it is believed that the details of construction of the device 10 are not necessary to an understanding of the present invention, the disclosures of the above applications are hereby incorporated by reference into the present disclosure.

For present purposes, it should be sufficient to note that the device 10 includes the usual housing 14 providing a handle 16 shaped to be grasped by the operator. Mounted within the housing in conventional fashion is a pneumatically actuated fastener driving means in the form of a piston and a fastener driving element, indicated in dotted lines at 18 in FIG. 1. The piston is mounted within a cylinder for movement through successive cycles of operation, each of which includes a fastener driving stroke and a return stroke. This movement is under the control of a fluid pressure control system which includes a reciprocatorily mounted depending valve actuating member 20 forming a part of the actuating mechanism 12. In the embodiment shown, the actuating member 20 is biased into an outwardly extending inoperative position, as by a spring 22, upon movement into an inwardly disposed operative position initiates the fastener driving stroke of the piston and driver element 18. Movement of the actuating member 20 from its operative position back into its inoperative position initiates the return stroke of the piston and driver element. The device 10 also includes the usual fastener magazine assembly, generally indicated at 24, for receiving a supply of fasteners and for feeding successive fasteners into the drive track in a position to be driven outwardly thereof into a workpiece during subsequent fastener driving strokes of the fastener driving element.

The actuating mechanism 12 also includes a contact trip element 26 having a lower portion reciprocatorily mounted within the nosepiece of the housing adjacent the drive track, an intermediate portion extending rearwardly from the upper end of the lower portion and an upper vertically extending portion which, for purposes of the present application, may be considered a work contact responsive member. As indicated in FIG. 1, the member 26 is resiliently urged into a downward inoperative position by a spring 28 so that the lower end portion thereof extends beyond the discharge end of the drive track. The work contact responsive member 26 is moveable from its normal inoperative position upwardly into an operative position in response to the movement of the device 10 into cooperative engagement with a workpiece. Movement of the device away from the workpiece serves to effect movement of the work contact responsive member 26 from its operative position back into its inoperative position under the action of the spring 28.

The actuating mechanism 12 also includes a conventional trigger member 30 which is pivotally mounted on the housing, as by a pivot pin 32, in a position adjacent the actuating member 20 and the work contact responsive member 26. The trigger member is biased into a normal inoperative position as by a hairpin spring 34. In accordance with usual practice, the trigger member 30 is moved from its inoperative position into an operative position in response to digital pressure by the operator. Release of the digital pressure by the operator will result in the movement of the trigger member from its operative position back into its inoperative position under the action of the spring 34.

In accordance with the principles of the present invention, the actuating mechanism 12 of the present invention includes an enabling means in the form of an enabling structure, generally indicated at 36, cooperatively interrelated with the members 20, 26, and 30, so as to effect the three enumerated functions or movements previously stated. A preferred arrangement of the enabling structure 36 with respect to the members 20, 26 and 30 is illustrated in FIGS. 2-7. As best shown in FIGS. 2 and 3, the enabling structure 36 is preferably formed by a U-shaped plate element having the bight section thereof centrally apertured. The legs of the U-shaped element provide a pivot portion 38 which, in the embodiment of FIGS. 2-7, is pivotally connected with the depending end portion of the actuating member 20, as by a pivot pin 40. One end of the bight section provides an arm portion 42 which is mounted in sliding contact with the work contact responsive member 26. The opposite end of the bight section has an arm portion 44 extending therefrom in the direction of the arm portion 42 which is provided by a separate angularly bent plate element rigidly secured to the U-shaped element by any suitable means, such as welding or the like.

The enabling structure 36 is resiliently urged to pivot in a counter-clockwise direction, as viewed in FIG. 2, by suitable spring means which, as shown, is in the form of a U-shaped hairpin spring 46. The spring 46 resiliently biases the enabling structure 36 into a limiting position determined by the engagement of a stop pin or rivet 48 with the actuating member 20 which extends across the pivot portion 38 of the U-shaped plate element. The enabling structure 36 is functionally interrelated to the trigger member 30 by means of a pin or rivet 50. The pin 50 is mounted on the trigger member 30 and is related to the pivotal axis of the trigger member 30, provided by the pivot pin 32, such that the pin 50 moves in an arc which is out of contact with the arm portion 44 of the enabling structure 6 when disposed in its limiting position and through an arcuate path which is in general alignment with the pivot pin 40 in the direction of the movement of the actuating member 20.

As previously indicated, the enabling structure 36 provides for the following three functions or movements: (1) movement of the trigger member 30 into its operative position when the work contact responsive member 26 is in its inoperative position without movement of the actuating member 20 into its operative position; (2) movement of the trigger member 30 into its operative position when the work contact responsive member 26 is in its operative position to effect movement of the actuating member 20 into its operative position; and (3) movement of the work contact responsive member 26 into its operative position when the trigger member 30 is in its inoperative position without movement of the actuating member 20 into its operative position. The accomplishment of movement (1) is illustrated in dotted lines in FIG. 2. It will be noted that when the trigger member 30 is moved into its operative position by digital pressure of the operator, the pin 50 will move through the arcuate path indicated in dotted
As previously stated, the pin remains out of engagement with the arm portion 44 of the enabling structure when the latter is disposed in its limiting or first position. Consequently, movement of the trigger member alone into its operative position will not effect movement of the actuating member 20 into its operative position.

The accomplishment of movement (2) is illustrated in FIGS. 4 and 5. FIG. 4 illustrates the position of the parts when the work contact responsive member 26 has been moved into its operative position by engagement of the device with a workpiece. It will be noted that the sliding connection between the member 26 and the arm 42 will effect a pivotal movement of the enabling structure 36 about its pivot pin 40 in a clockwise direction, as viewed in FIG. 4, against the bias of spring 46. The enabling structure is thus moved in response to the movement of the work contact responsive member 26 into its operative position into a position in which the arm portion 44 is now disposed in the path of movement of the pin 50. The portion of the enabling structure 36 extending from the arm 44 is then disposed in motion transmitting relation between the trigger member 30 and the actuating member 20. FIG. 5 illustrates the position of the parts after the trigger member 30 has been moved into its operative position. It will be noted, that the pin 50 is in engagement with the arm portion 44 and that the enabling structure 36 has moved the actuating member 20 into its operative position in response to the movement of the trigger member 30 into its operative position.

The accomplishment of movement (3) is illustrated in FIG. 6. The trigger member 30 is shown in its operative position in which the pin 50 is moved into the dotted line position shown in FIG. 2 past the arm portion 44 of the enabling structure 36. As shown in FIG. 6, when the work contact responsive member 26 is then moved into its operative position, the pivotal movement of the enabling structure 36 about its pivot pin 40 will take place without engagement of the arm portion 44 with the pin 50 and hence no movement of the actuating member 20 will occur.

By virtue of the three movements of functions provided by the enabling structure 36, accidental actuation of the device 10 is prevented when the operator is holding the device by the handle 16 with digital pressure on the trigger member 30 and the work contact responsive member 26 is accidentally engaged with a foreign object. The digital pressure on the trigger member 30 will have moved the latter into its operative position so that the accidental engagement of the work contact responsive member 26 with a foreign object will merely result in the enabling structure 36 assuming the position shown in FIG. 6 wherein no actuation can take place.

FIG. 7 illustrates the operation of the enabling structure 36 which prevents double firing. It will be noted that FIG. 7 illustrates the position of the parts after actuation has occurred, as in FIG. 5, and the device has been moved off of the workpiece a predetermined distance so that the work contact responsive member 26 has been moved a predetermined distance toward its inoperative position. This predetermined distance may be set at any desired dimension and preferably a dimension which is equal to the normal rebound of the device which will occur in response to the actuation thereof. For the device 10 an exemplary dimension is approximately one-fourth inch. It will be understood that it is important that the movement of the device away from the workpiece, either by rebound in the normal operation of the device or otherwise, a distance less than its full distance into its operative position must not have the effect of recycling the actuating member when the trigger member is maintained in its operative position and the device is returned into engagement with the workpiece, otherwise doubling firing will occur. This doubling firing is prevented by virtue of the configuration of the interengaging surfaces of the arm portion 44 and pin 50 which are indicated at 52 and 54 respectively.

It can be seen from FIG. 7 that the configuration of the interengaging surfaces 52 and 54 are such that they will disengage from one another after the work contact responsive member 26 has been moved the aforesaid predetermined distance with the trigger member 30 maintained in its operative position and hence, the actuating member 20 in its operative position. As the surfaces 52 and 54 move out of engagement, the actuating member 20 and enabling structure 36 move down into a position such as shown in dotted lines in FIG. 7. In this position, the enabling structure is now disposed in a position out of motion transmitting relation between the trigger member 30 and the actuating member 20 so that no further movement of the actuating member 20 can occur in response to any movement of the work contact responsive member 26 until the trigger member 30 is released and allowed to move back into its inoperative position.

FIG. 8 illustrates a modification of the interengaging surfaces 52 and 54 which serve to achieve a slightly different function which still, nevertheless, prevents double firing. As shown in FIG. 8, surface 52 is replaced by a longer surface 56 which will remain in engagement with the surface 54 of the pin 50, after the parts have reached the actuating position, as shown in FIG. 5, and following any movement of the work contact responsive member 26 toward its inoperative position so long as trigger member 30 is maintained in its operative position. After the work contact responsive member 26 has been moved into its inoperative position, movement of the trigger member 30 toward its inoperative position a predetermined distance will disengage the surface 56 from the surface 54 of the pin 50. As the surfaces 56 and 54 disengage, the enabling structure 36 will pivot into its initial limiting position under the action of spring 46, as shown in dotted lines in FIG. 8, and spring 22 will return the actuating member 20 to its inoperative position.

FIG. 9 shows still another modification of the surface 52 which achieves still a different function while, nevertheless, preventing double firing. In FIG. 9 the surface 52 has been replaced by a surface 58 which is shortened with respect to that provided by the surface 52. As shown in FIG. 9, the surface 58 is foreshortened to an extent such that as the trigger member 30 reaches its operative position, the actuating member 20 having already been moved into its operative position with the work contact responsive member 26 having already been moved into its operative position, the surface 54 provided by the trigger member pin 50 will disengage from the surface 58 allowing the spring 22 to return the actuating member 20 to its inoperative position.

The above three modifications, as aforesaid, all prevent double firing and insure that, any time the trigger member 30 is in its operative position, movement of the
work contact responsive member into its operative position will not effect movement of the actuating member 20 into its operative position. The three embodiments differ in providing the actuating mechanism 12 with different capabilities with respect to drag firing. The operation provided by the surface 52 will prevent drag firing of a device which has a rebound equal to or greater than the predetermined distance at which the surface 52 disengages from the pin surface 54. This function can be advantageously be built into fastener driving devices 10 of relatively large capacity having relatively large rebound characteristics. Thus, it would be desirable to prevent the possibility of driving a fastener any time that the device is spaced from the workpiece a distance greater than one-fourth inch. With the arrangement of FIG. 7, such action is prevented either as a result of rebound or of any other movement of the device from the workpiece surface during drag firing or otherwise. It should be noted that this capability can be provided in fastener driving devices of lower capacity where the rebound is negligible and drag firing would be possible while still preventing drag firing with the tool off of the surface the aforesaid predetermined distance.

The surface configuration 56 shown in FIG. 8 would provide the capability of drag firing irrespective of the rebound characteristics of the particular tool to which the actuating mechanism is applied, whereas the foreshortened surface 58 of FIG. 9 would prevent drag firing on any tool. The latter arrangement would likewise prevent the tool from being used in an autofire mode of operation, a capability which could be accomplished with the arrangement of FIG. 8 as well as FIG. 7 so long as the rebound of the tool does not equal or exceed the aforesaid predetermined distance.

Referring now to FIGS. 10–13, there is shown therein a motion transmitting mechanism, generally indicated at 60 embodying the principles of the present invention which is of a modified form. The actuating mechanism 60 embodies essentially the same components or parts as the mechanism 12 previously described and hence, the parts have been designated by corresponding numerals with the prefix 6 supplied thereto. Consequently, an understanding of the mechanism 60 can be obtained by simply referring to the changes which are effected in comparison with the mechanism 12 previously described.

The enabling structure 136 is formed of a straight plate element bifurcated at one end to provide the pivot portion 138. Instead of being connected with the actuating member, the pivot portion 138 is pivoted to the upper end of the work contact responsive member 126 by the pivot pin 140. The opposite end section of the straight plate provides an arm portion 142 which is disposed in slideable engagement with the lower end of the actuating member 120, instead of the work contact responsive member, as before. The enabling structure 136 also includes a bent plate providing an arm portion 144 which is related to the pin 150 on the trigger member 130 in the same manner as before. Spring 146 acts on the work contact responsive member 126 rather than the actuating member and the stop pin 48 previously provided is eliminated.

FIGS. 14–17 illustrate still another form of actuating mechanism, generally indicated at 62, embodying the principles of the present invention. Here again, the mechanism 62 includes generally the same component parts as the mechanisms 12 and 60, and, in this case, the same numerals as applied to the mechanism 12 are used with the prefix 6 supplied thereto. As best shown in FIG. 14, the enabling structure 236 is formed of a U-shaped plate element similar to the U-shaped element of the enabling structure 36, the legs providing a pivot portion 238 which, in this instance, is pivotally connected with the trigger member 230 by a pair of aligned spaced pivot pins 240. The enabling structure 236 includes an arm portion 242 at one end of the bight section which is disposed in sliding engagement with the work contact responsive member 226. The opposite end of the bight section is formed with an interior notch which defines two transversely spaced aligned arm portions 244. The pin 250 is connected with the actuating member 220 instead of the trigger member, as before, but has its ends disposed in generally the same relation with respect to the arm portions 244 as in the previous embodiments. Spring 246 acting between the trigger member 230 and enabling structure 236, permits spring 246 and stop pin 48 both to be eliminated.

It can be seen that the embodiment of FIGS. 10–12 and FIGS. 14–17 operate in substantially the same way as the embodiment of FIGS. 2–7. Each of these embodiments can be modified in the same manner as indicated in FIGS. 8 and 9.

In all of the embodiments the enabling structure has the following common movements: (1) movement from an inoperative position into a nonoperating position out of motion transmitting relation between the trigger member and the actuating member in response to the sequentially performed movements of (a) the trigger member into its operative position and then (b) the work contact responsive member into its operative position during at least one of the sequentially performed movements (see FIGS. 6, 13 and 17); (2) movement from the inoperative position into an operating position out of motion transmitting relation between the trigger member and the actuating member in response to the movement of the work contact responsive member into its operative position with the trigger member maintained in its inoperative position (see FIGS. 4, 11 and 15); and (3) movement from the operating position into an operative position in motion transmitting relation between the trigger member and the actuating member in response to the movement of the trigger member into its operative position with the work contact responsive member maintained in its operative position (see FIGS. 5, 12 and 16). With the mechanisms 12 and 60, movement (1) occurs only during the second of the sequentially performed movements, i.e., the movement of the work contact responsive member 26 or 126 into its operative position; whereas with the mechanism 62, movement (1) occurs during both of the sequentially performed movements as shown in FIGS. 14A and 17 the

With respect to the embodiment of FIGS. 14–17, it will be understood that the arm portion 242 may be foreshortened to an extent such that it is in engagement with the work contact responsive member 226 when the trigger member is in its inoperative position, but will move with the trigger member when the latter is moved into its operative position out of the path of movement of the work contact responsive member 226 from its inoperative position toward its operative position. With such an arrangement the interfingering surfaces of the arm portion 242 and the work contact re-
responsive member 226 may serve to provide the disengaging function of the surfaces 52 and 54. It thus will be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing preferred specific embodiment has been shown and described for the purpose of illustrating the functional and structural principles of this invention and is subject to change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

What is claimed is:

1. A fastener driving device including a portable housing, fluid pressure operated fastener driving means carried by said housing for movement through successive cycles of operation each of which includes a fastener driving stroke and a return stroke, fastener magazine means carried by said housing for receiving a supply of fasteners and feeding successive fasteners into a position to be driven into a工作piece d ring successive fastener driving strokes of said fastener driving means, fluid pressure control means including an actuating member carried by said housing for movement from a normal inoperative position into an operative position in response to the movement of said device into cooperating engagement with a workpiece, and a trigger member carried by said housing for manual movement from a normal inoperative position into an operative position, the improvement in combination therewith which comprises enabling means operatively associated with said members for (1) enabling movement of said trigger member into its operative position when said work contact responsive member is in its inoperative position without movement of said actuating member into its operative position, (2) enabling movement of said trigger member into its operative position when said work contact responsive member is in its operative position to effect movement of said actuating member into its operative position, and (3) enabling movement of said work contact responsive member into its operative position when said trigger member is in its operative position without movement of said actuating member into its operative position.

2. The combination as defined in claim 1, wherein said enabling means includes an enabling structure disposed in an inoperative position when said members are disposed in their inoperative positions, and means mounting said enabling structure in operatively interrelated relation with respect to said members for movement (1) from said inoperative position into a nonoperating position out of motion transmitting movement between said trigger member and said actuating member in response to the sequentially performed movements of (a) said trigger member into its operative position and then (b) said work contact responsive member into its operative position, during at least one of said sequentially performed movements, (2) from said inoperative position into an operating position out of motion transmitting movement between said trigger member and said actuating member in response to the movement of said work contact responsive member into its operative position with said trigger member maintained in its inoperative position, and (3) from said operating position into an operative position in motion transmitting relation between said trigger member and said actuating member in response to the movement of said trigger member into its operative position with said work contact responsive member maintained in its operative position.

3. The combination as defined in claim 1, wherein said enabling means includes an enabling structure having first surface means, one of said members having second surface means thereon disposed in engagement with said first surface means during the aforesaid movement.

4. The combination as defined in claim 3, wherein said first and second surface means are operable to disengage in response to the movement of said work contact responsive member a predetermined distance toward its inoperative position, thereby permitting said actuating member to move into its inoperative position while said trigger member is maintained in its operative position.

5. The combination as defined in claim 3, wherein said first and second surface means are operable to disengage as said actuating member reaches its operative position thereby permitting said actuating member to move into its inoperative position while said trigger member is maintained in its operative position.

6. The combination as defined in claim 3, wherein said first and second surface means are operable to remain in engagement in response to the movement of said work contact responsive member into its inoperative position with said trigger member maintained in its operative position to thereby render the movement of said actuating member into its inoperative position responsive to the movement of said trigger member toward its inoperative position.

7. A fastener driving device including a portable housing having a handle adapted to be manually gripped by an operator, fluid pressure operated fastener driving means carried by said housing for movement through successive cycles of operation each of which includes a fastener driving stroke and a return stroke, fastener magazine means carried by said housing for receiving a supply of fasteners and feeding successive fasteners into a position to be driven into a workpiece during successive fastener driving strokes of said fastener driving means, fluid pressure control means including an actuating member carried by said housing for reciprocating movement from a normal inoperative position into an operative position for initiating the movement of said fastener driving means through a single fastener driving stroke and from said operative position into said inoperative position for initiating the movement of said fastener driving means through a single return stroke, a work contact responsive member carried by said housing for reciprocating movement adjacent said actuating member from a normal inoperative position into an operative position in response to the movement of said device into cooperating engagement with a workpiece and from said operative position into said inoperative position in response to the movement of said device out of cooperative engagement with the workpiece and a trigger member carried by said housing adjacent said actuating member in a position to be engaged by a finger of an operator grasping said handle for pivotal movement from a normal inoperative position into an operative position in response to digital pressure and from said operative position.
situation into said inoperative position in response to the release of said digital pressure, the improvement in combination therewith which comprises enabling means operatively associated with said members for (1) enabling movement of said trigger member into its operative position when said work contact responsive member is in its inoperative position without movement of said actuating member into its operative position, (2) enabling movement of said trigger member into its operative position when said work contact responsive member is in its operative position to effect movement of said actuating member into its operative position, and (3) enabling movement of said work contact responsive member into its operative position when said trigger member is in its operative position without movement of said actuating member into its operative position.

8. The combination as defined in claim 7, wherein said enabling means includes an enabling structure disposed in an inoperative position when said members are disposed in their inoperative positions and means mounting said enabling structure in operatively interrelated relation with respect to said members for movement (1) from said inoperative position into a nonoperating position out of motion transmitting relation between said trigger member and said actuating member in response to the sequentially performed movements of (a) said trigger member into its operative position and then (b) said work contact responsive member into its operative position, during at least one of said sequentially performed movements. (2) from said inoperative position into an operating position out of motion transmitting relation between said trigger member and said actuating member in response to the movement of said work contact responsive member into its operative position with said trigger member maintained in its inoperative position and (3) from said operating position into an operative position in motion transmitting relation between said trigger member and said actuating member in response to the movement of said trigger member into its operative position with said work contact responsive member maintained in its operative position.

9. The combination as defined in claim 8, wherein said enabling structure is pivotally interconnected with said actuating member and is moved from said inoperative position into said nonoperating position only during the movement of said work contact responsive member in said sequentially performed movements.

10. The combination as defined in claim 9, wherein said enabling structure is pivotally interconnected with said trigger member.

11. The combination as defined in claim 9, wherein said enabling structure is movable from said inoperative position into said nonoperating position out of motion transmitting relation between said trigger member during both of said sequentially performed movements.

12. The combination as defined in claim 11, wherein said enabling structure includes first surface means, one of said members having second surface means thereon disposed in engagement with said first surface means during the aforesaid movement of said enabling structure from said operating position to said operative position.

13. The combination as defined in claim 14, wherein said first and second surface means are operable to disengage in response to the movement of said work contact responsive means a predetermined distance toward its inoperative position thereby permitting said actuating member to move into its inoperative position while said trigger member is maintained in its operative position.

14. The combination as defined in claim 14, wherein said first and second surface means are operable to disengage as said actuating member reaches its operative position, thereby permitting said actuating member to move into its inoperative position while said trigger member is maintained in its operative position.

15. The combination as defined in claim 14, wherein said first and second surface means are operable to remain in engagement in response to the movement of said work contact responsive member into its inoperative position with said trigger member maintained in its operative position to thereby render the movement of said actuating member into its inoperative position responsive to the movement of said trigger member toward its inoperative position.

16. The combination as defined in claim 14, wherein said first and second surface means are operable to remain in engagement in response to the movement of said work contact responsive member into its inoperative position with said trigger member maintained in its operative position to thereby render the movement of said actuating member into its inoperative position responsive to the movement of said trigger member toward its inoperative position.

17. The combination as defined in claim 14, wherein said second surface means is on said actuating member.

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Notice of Adverse Decision in Interference

In Interference No. 98,800, involving Patent No. 3,784,077, G. E. Burke, Jr., W. G. Lemos and D. M. Shippee, PORTABLE PNEUMATIC FASTENER DRIVING DEVICE WITH IMPROVED ACTUATING MECHANISM, final judgment adverse to the patentees was rendered Aug. 20, 1976, as to claims 1 and 7.

[Official Gazette May 3, 1977.]