March 20, 1951 T. A. TRIPLETT ET AL 2,546,114

PNEUMATIC DIE STAMPING MACHINE

Filed Aug. 28, 1944 2 Sheets-Sheet 1

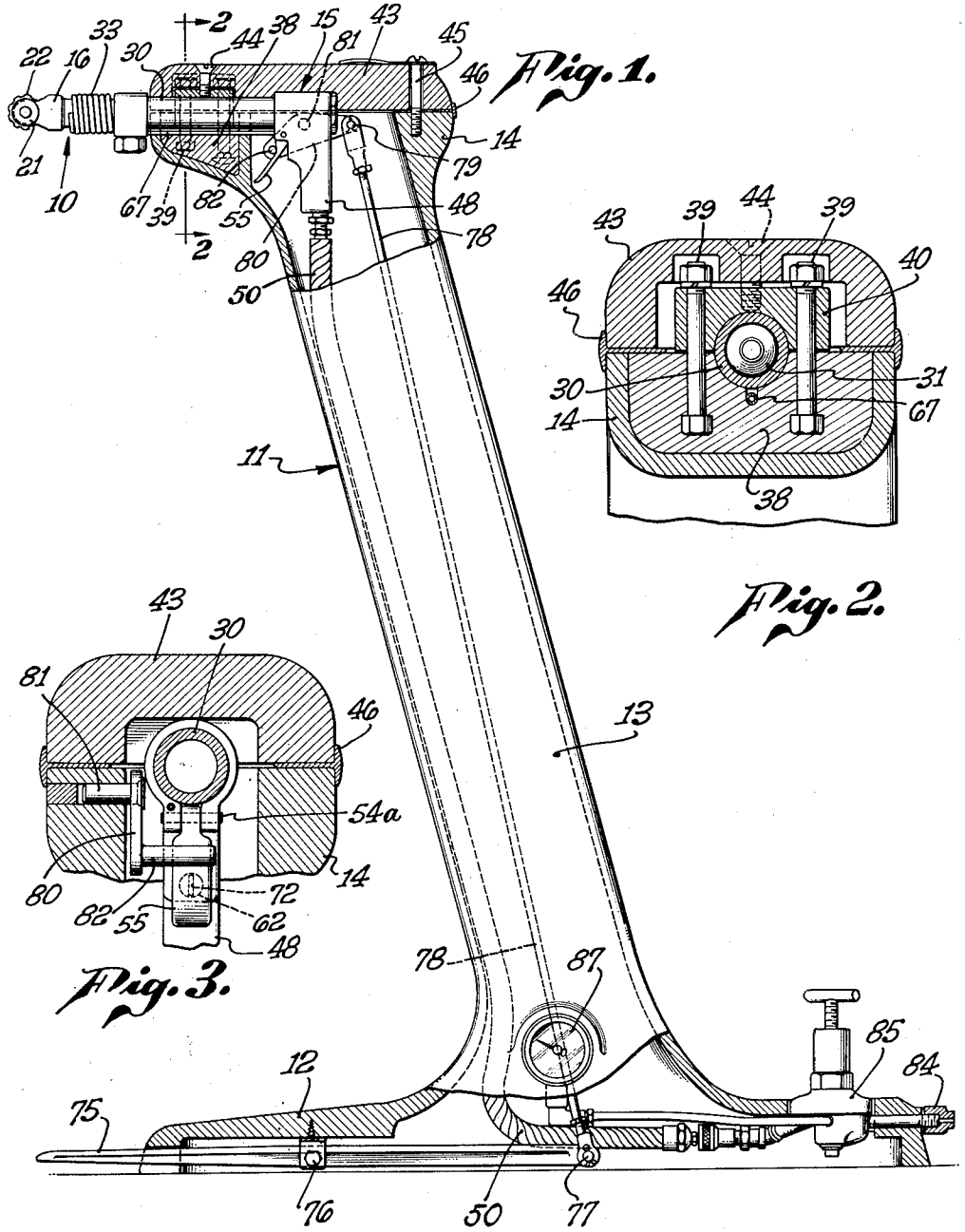


Fig. 1.

Fig. 2.

Fig. 3.

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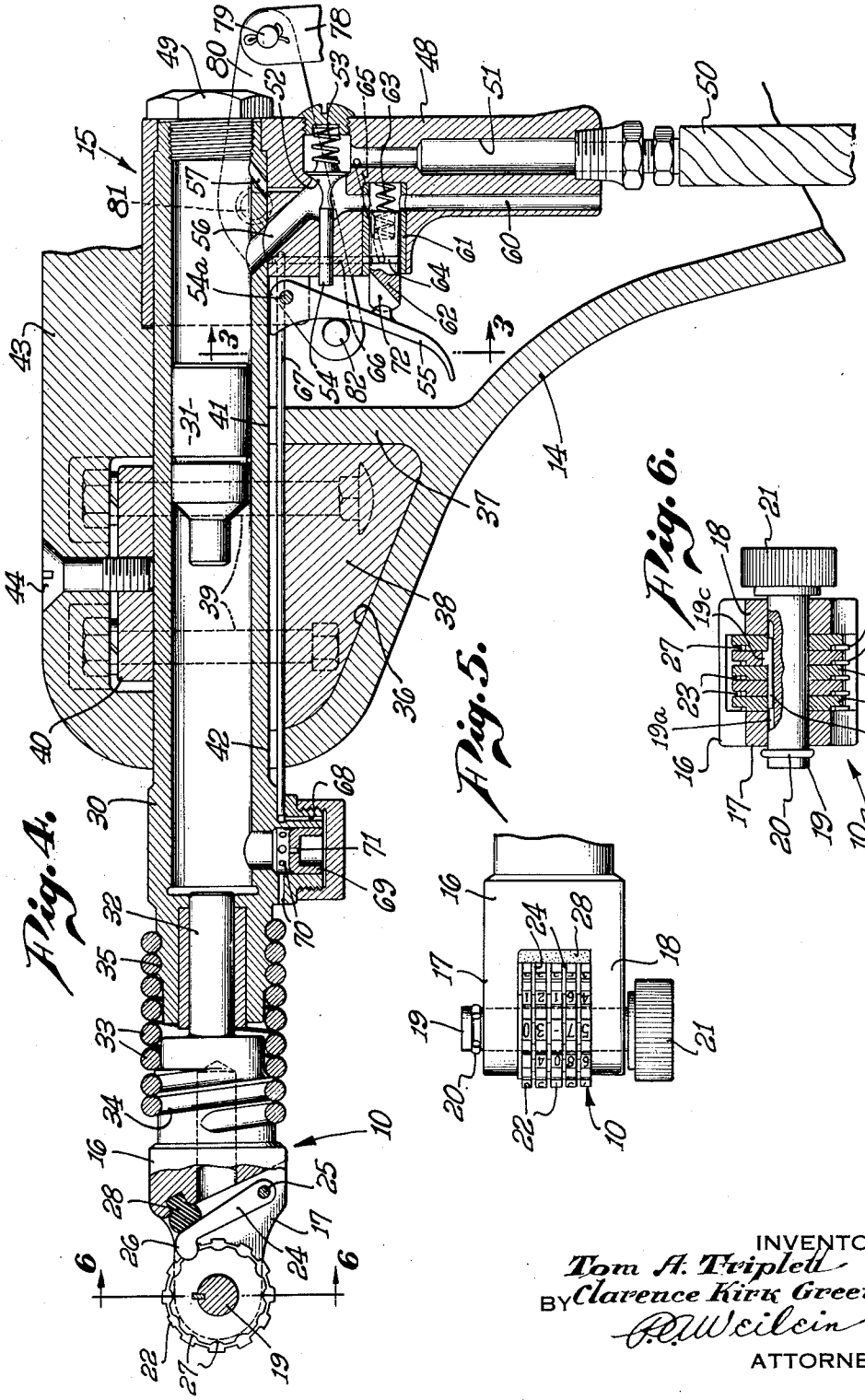


Fig. 4.

Fig. 5.

Fig. 6.

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PNEUMATIC DIE STAMPING MACHINE

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5 Claims. (Cl. 101—4)

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This invention relates to stamping machines, and particularly to pneumatic die stamping machines for stamping numbers or other indicia on articles.

It is a principal object of this invention to provide a stamping machine which is rapid in operation, and which is so constructed and arranged as to permit rapid operation thereof for long periods without inducing operator fatigue and discomfort.

It is another object of this invention to provide a stamping machine particularly adapted to stamping numbers or other indicia on articles of various shapes and sizes held in the operator's hands.

It is a still further object of this invention to provide a stamping machine which produces impressions of uniform quality irrespective of the manner in which the operator manipulates the controls.

It is a still further object of this invention to provide a stamping machine wherein the stamping effect may be regulated and controlled in accordance with the nature of the article to be stamped.

It is a still further object of this invention to provide a stamping machine incorporating means precluding the possibility of making secondary or "shadow" impressions on an article due to rebound of the stamping head following the initial stamping blow.

It is a still further object of this invention to provide a stamping machine which is self-stabilized and which therefore is not required to be anchored to its support.

It is still another object of this invention to provide a power operated stamping machine wherein the actuating mechanism is wholly inclosed within a hollow support, the only exposed elements being the stamping head and manual operating pedal.

It is still another object of this invention to provide a power operated stamping machine wherein there is no danger of repeating the stamping operation on a single article by prolonged holding of the operating lever in operating positon.

It is a still further object of this invention to provide a novel and improved stamping head of the type adapted to make impressions of a series of numbers, letters or other indicia.

This invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown a form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this

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detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

In the drawings:

Figure 1 is a view partly in side elevation and partly in vertical section, illustrating the general arrangement of a machine embodying the invention;

Figure 2 is a transverse vertical sectional view taken on line 2—2 of Figure 1;

Figure 3 is a transverse vertical sectional view taken on line 3—3 of Figure 4;

Figure 4 is an enlarged fragmentary sectional view of the stamping head and pneumatic operating mechanism;

Figure 5 is a top plan view of the stamping head; and,

Figure 6 is a transverse vertical sectional view taken on line 6—6 of Figure 4.

An important practical aspect of the instant invention pertains to the general arrangement of parts whereby the stamping head is disposed at a convenient height, and is so located with respect to the operator's position that articles to be stamped may be presented to the head with a minimum of effort and inconvenience to the operator. The manner in which this object is attained will be apparent by reference to Figure 1, wherein it will be observed that the stamping head, generally designated 10, is mounted on the upper, overhanging extremity of a pedestal support, generally designated 11. The support comprises a base 12 of suitable dimensions to provide a stable structure, hereinafter pointed out, and an integral pedestal 13 extending upwardly and inclined forwardly in order to dispose the stamping head 10 in an overhanging position with respect to the forward edge of the base 12. Housed within an enlarged head portion 14 at the upper extremity of the pedestal 13 is an actuator assembly 15, herein shown as a single-shot pneumatic hammer or gun.

The stamping head 10, shown most clearly in Figures 4, 5 and 6 is in this instance a numbering head capable of making an impression of any number up to five digits. It will be understood, however, that the head may be provided with means for making an impression of letters or other indicia. The head comprises a yoke or clevis 16 having a pair of spaced yoke arms 17 and 18 projecting forwardly therefrom, in which is journaled a shaft 19. The shaft is retained in the yoke by any suitable means such as a split retainer ring 20, and is provided at its opposite end with a knob 21 of rubber or the like, by which the shaft may be rotated. A series of die stamp wheels 22, each carrying die characters such as a series of consecutive numerals or other indicia on its periphery, are mounted on the shaft 19 within the recess defined by the yoke arms 17 and

18. One of the wheels 22 may be keyed to the shaft 19 to be rotated to the desired position by turning the knob 21 by hand. As shown in Figure 6, the shaft is provided with a keyway 19a for the reception of a key 19b having an elongated body portion lying wholly within the keyway and an integral projection 19c projecting radially outwardly into a keyward formed in one of the wheels 22.

In order to yieldingly retain the die stamp wheels 22 in any desired oriented position on the shaft 19, each wheel is reduced in thickness adjacent its periphery to provide slots 23 (Figure 6) for the reception of a series of pawls 24 pivotally mounted at 25 on the yoke 16. As shown most clearly in Figure 4, each pawl has a rounded head 26 at the free end thereof, which is adapted to selectively engage any one of a circumferential series of shallow arcuate grooves 27 formed in the respective wheels between each pair of adjacent die characters. A block 28 of rubber or other resilient material is mounted in a transversely extending groove in the yoke and engages the pawls 24 to yieldingly hold them in engagement with the groove 27 in the wheels, the arrangement being such as to permit manual rotation of each wheel to a selected position when desired. A spanner wrench (not shown), suitably shaped to engage one of the raised die characters, may be provided for rotating the wheels which are mounted for free rotation on the shaft 19.

The stamping head 10 is mounted on the forward extremity of the barrel 30 of the pneumatic gun 15 in such a manner as to enable the piston 31 to impart a blow thereto and thus imprint the selected number or other indicia on an article held against the forward face of the wheels 22. To this end, the stamping head is provided with a rearwardly projecting cylindrical shank 32 which is inserted in a bore in the forward end of the gun barrel, the inner extremity of the shank serving as an anvil to receive the blow from the piston. It is important that the head 10 be secured to the barrel by a yieldable or resilient coupling so as not to transmit the force of the impact to the entire gun mechanism. It is even more important, however, that the resilient coupling be of such a nature that the recoil of the head, after imparting the initial stamping blow to the article, is completely dampened so that the head does not rebound and make one or more secondary or "shadow" impressions on the article. In the present instance, the coupling is in the form of a stiff coil spring 33 which engages helical threads 34 and 35 formed on the head 10 and the forward end of the barrel 30, respectively. It will be understood that if the spring were normally in a relaxed or unstressed condition, the impact of a blow on the anvil 32 would induce axial vibration of the spring, which would in turn cause the head to make a series of impressions on the article. To overcome this objection, the spring 33 is wound with its coils closed and with an initial pre-load, that is, the spring is normally in stressed condition. The pre-loading of the spring is of a predetermined magnitude, and exceeds the rebound force developed by the recoil of the head 10 after striking the initial stamping blow. In this manner, it is impossible for the head to make secondary or "shadow" impressions on the article being stamped.

The manner in which the gun 15 is mounted in the pedestal head 14 is worthy of special attention. In order to obtain a rigid mounting for the gun, a unique clamping arrangement is provided. It will be observed that a pocket 36 is provided between the forward wall of the head 14 and a partition 37, this pocket being filled with a thermoplastic material 38 such as "Cerromatrix." A plurality of bolts 39 (see Figures 2 and 4) are partially embedded in the material 38 in upright position, and extend upwardly on either side of the barrel 30 through suitably spaced bolt holes in a clamp 40 embracing the upper surface of the barrel, all as clearly shown in Figure 2. By tightening the nuts on the upper ends of the bolts, the barrel is securely clamped against the upper surfaces 41 and 42 of the partition 37 and the forward wall of the head 14, as well as against the side walls of the head 14.

As shown most clearly in Figure 2, the pedestal head 14 is split horizontally in the axial plane of the barrel 30, forming a removable cover 43, which is secured to the head by cap screws 44 and 45 (Figure 1). The joint between the head and the cover is sealed by a trim 46, T-shaped in cross-section, which not only excludes dust and moisture from the interior of the head but also imparts an attractive appearance to the machine.

Referring now to the pneumatic gun 15, it will be observed with reference to Figure 4, that a valve body 48 is secured to the inner extremity of the barrel 30 by a threaded plug 49 which also closes the inner end of the bore of the barrel. A supply conduit 50 for compressed air or other actuating fluid is connected to the lower end of the valve body, and communicates with a supply passage 51 leading to a poppet valve 52. The valve 52 is normally held against its seat by a compression spring 53, and is adapted to be opened by engagement of the valve stem 54 by a trigger 55, pivotally mounted at 54a on the valve body 48, to admit compressed air through ports 56 and 57 to the bore of the barrel at the rear side of the piston 31, and thus propel the piston forwardly.

In order to vent the bore of the barrel 30 rearwardly of the piston 31 to the atmosphere and thus permit return of the piston to its initial position, a vent port 60 communicates at its inner end with the port 56 and at its other end communicates with the interior of the pedestal 13. This port is intersected by a valve bushing 61 in which is slidably mounted a cylindrical valve 62, normally retained in a forward position by a compression spring 63. An annular groove 64 is formed in the periphery of the valve 62 and, when the valve is in its normal position as shown in Figure 4, establishes communication between two ports 65 and 66 drilled in the valve body 48. The port 65 communicates with the inlet passage 51, and the port 66 communicates with the rearward end of a tube 67 which extends forwardly beneath and parallel to the barrel 30.

At its forward end, the tube 67 communicates through a short vertical passage 68 with the underside of a cup-shaped piston valve 69 which controls a series of radial vent ports 70. When uncovered, these ports vent the bore of the barrel 30 forwardly of the piston 31 to the atmosphere, to allow escape of air from the barrel during the forward travel of the piston. For the purpose of this description, the piston valve 69 is shown in its lower position with the ports 70 uncovered, but it will be understood that when the cylindrical valve 62 is in its normal position, air is admitted under pressure from the inlet passage 51 through the port 65, annular groove 64, port 66, tube 67 and port 68 to the underside of

the piston valve 69, thus forcing the valve upwardly and closing the ports 70. A small orifice 71 in the valve admits air under pressure to the bore of the barrel 30 to return the piston 31 to its retracted position and hold it in that position while the gun is inoperative.

It will be observed that the cylindrical valve 62 is held in constant engagement with the trigger 55 by the spring 63, and that when the valve is in its normal position the trigger is spaced from the outer end of the poppet valve stem 54. The purpose of this arrangement is to enable the valve 62 to be moved to the right to close the vent port 60 and to break communication between the ports 65 and 66 prior to opening the main poppet valve 52. Movement of the valve 62 to the right not only cuts off the supply of air under pressure to the piston valve 69 by breaking communication between the ports 65 and 66, but also vents the port 66 to the atmosphere by bringing a milled slot 72 in the outer portion of the valve 62 into registry with the port 66. Upon release of the fluid pressure beneath the piston valve 69, it moves downwardly by gravity into the position shown in Figure 3, and uncovers the radial vent ports 70, thus venting the forward portion of the bore of the barrel 30 to the atmosphere.

Continued movement of the trigger 55 to the right causes it to engage the poppet valve stem 54 and open the valve 52, thus admitting air under pressure from the supply passage 51 to the gun barrel through ports 56 and 57. When the piston is in its rearward position it closes the port 56, thus permitting only a small volume of air to enter the barrel behind the piston through the relatively small port 57 to impart initial movement to the piston. However, as soon as the piston clears the large port 56, a larger volume of air is admitted therethrough to impart sufficient velocity to the piston to cause it to strike the inner end of the shank 32 with considerable force.

It will be apparent that with the arrangement described above, only a single stroke of the piston is produced each time the trigger 55 is actuated, and that the trigger must be permitted to return to its initial position before the piston can effect its return stroke. Upon release of the trigger, the compression spring 63 forces the cylindrical valve 62 to the left, thus allowing the spring 53 to close the poppet valve 52 and re-establishing communication between the ports 65 and 66, and also opening the vent port 60. Air under pressure is thus admitted to the forward end of the barrel 30 to move the piston rearwardly. This completes the cycle, and the gun is now ready for a repetition of the operation.

Referring now to Figure 1, it will be observed that suitable linkage is provided for actuating the trigger 55 by a foot pedal 75 pivotally mounted in the pedestal base 12 on a transverse pivot 76. The inner extremity of the pedal 75 is pivotally connected at 77 to the lower end of a rod 78 extending upwardly within the hollow pedestal 13. The upper extremity of the rod is pivotally connected at 79 to one end of a rocker arm 80 pivotally attached intermediate its ends at 81 to the side wall of the valve body 46. A pin 82 projects laterally from the forward end of the rocker arm into engagement with the trigger 55.

It will thus be apparent that when the pedal 75 is depressed by the operator's foot, the rod 78 is moved upwardly to rock the arm 80 in a counterclockwise direction about its pivot 81, thus causing the pin 82 to actuate the trigger 55 to the right and initiate a cycle of operation of the gun. It will be observed that the pedal 75 and the rocker arm 80 are substantially balanced on their respective pivots, so that upon release of the pedal by the operator the weight of the rod 78 causes these parts to return to their initial positions and allows the spring 63, acting through the valve 62, to return the trigger 55 to its initial position.

Actuating fluid may be admitted under suitable pressure to the supply passage 51 in any desired manner. For this purpose there is shown an air inlet connection 84 at the rear of the pedestal base 12, which may be connected to a source of supply, and which is connected, through a manually adjustable pressure regulating valve 85, with one end of the flexible conduit 50 extending upwardly within the hollow pedestal 13 and connected at its upper end to the valve body 48 in communication with the passage 51. A pressure gauge 87 may be mounted on the pedestal to indicate the pressure on the discharge side of the valve 85, to enable the operator to adjust the valve to obtain any desired operating pressure in accordance with the type of material to be stamped.

Adverting once more to the general construction of the pedestal support, it will be observed with reference to Figure 1 that by reason of the forward inclination of the pedestal 13, the center of mass of the machine is disposed a substantial distance forwardly of the center of the base 12, bearing in mind the fact that the enlarged head 14 and the pneumatic gun 15 housed therein constitute a substantial portion of the total mass. The pressure exerted in a horizontal direction against the head 19 by the operator tends to tilt the machine rearwardly about the lower rear edge of the base 12, and to reduce the pressure of the forward portion of the base against the supporting surface. The tilting moment of this force exerted by the operator is the product of the force and the vertical height of the head above the supporting surface. This tilting moment is opposed by a moment which is the product of the mass of the machine and the horizontal component of the distance between the rear edge of the base and the center of mass of the machine. Consequently the farther forward the center of mass is located, the less will be the tendency of the machine to tilt rearwardly, and the greater will be the frictional engagement of the base with the supporting surface. Hence by inclining the pedestal 13 forwardly and thus disposing the center of the mass of the machine at a greater horizontal distance from the rear edge of the base, the weight of the machine is more uniformly distributed over the entire base during operation. This increased frictional engagement of the entire base with the supporting surface effectually eliminates any tendency of the machine to shift its position due to vibration while in operation, and the machine need not be anchored to its support.

From the foregoing detailed description of one embodiment of the invention, it will be apparent that a stamping machine has been provided which possesses many distinct advantages. A pneumatic gun of the type described is characterized by instantaneous response to actuation of the trigger, thus making the machine particularly adaptable to mass production methods because of the unusually rapid rate at which articles of different shapes or sizes may be stamped. The

danger of inadvertent repeated stamping of the same article by prolonged depression of the foot pedal is averted by the "single shot" principle of the gun and by the damping effect of the resilient coupling connecting the head 10 to the barrel 30. The quality of the work performed is rendered uniform, for any given adjustment of the regulating valve, by reason of the fact that the force of the blow imparted to the stamping head is controlled solely by the regulated pressure of the actuating fluid, and is wholly independent of the amount of pressure applied to the foot pedal by the operator.

Furthermore, the pre-loaded spring coupling between the stamping head and the gun absorbs the rebound of the head following the initial stamping blow, and also limits the momentum imparted to the head by the impact of the piston, and hence produces a clear-cut, easily legible impression on lightweight articles held in the operator's hands, without unduly jarring the article and inducing operator fatigue. This latter characteristic of the machine, taken in conjunction with the general arrangement whereby the stamping head and the foot pedal are located in positions most conducive to comfort of the operator, permit rapid operation of the machine for extended periods of time with a minimum of operator fatigue and discomfort.

It will also be evident that the general arrangement including the upwardly and forwardly inclined pedestal affords maximum resistance to rearward tilting of the machine due to the pressure exerted on the stamping head by the operator, and hence reduces to a minimum any tendency of the machine to shift its position as the result of vibration. In other words, the machine is self-stabilized and is not required to be anchored to its support.

We claim:

1. In a stamping machine, a support comprising a base, a hollow upstanding column supported on the base and a hollow head on the upper extremity of said column, fluid actuated hammer mechanism mounted on said head and including a cylinder, a striking element therein, and valve means controlling admission of fluid to said cylinder to actuate said striking element, said valve means being enclosed within said hollow head, optionally operable valve actuating means mounted on said base, means extending within said hollow column and operatively connecting said valve actuating means with said valve means, and a stamping head operatively connected to said cylinder, said stamping head having one or more dies thereon.

2. In a stamping machine, a support comprising a base, a hollow upstanding column supported on the base and a hollow head on the upper extremity of the column, fluid actuated stamping mechanism mounted on the head and including a cylinder, a striking element therein, a stamping head operatively associated with the cylinder and striking element, a valve body connected to the cylinder and being wholly disposed within the hollow head, valve means in the valve body for controlling admission of fluid to the cylinder to actuate the striking element, optionally operable valve actuating means mounted on the base, and means extending within the hollow column between the base and the hollow head and operatively connecting said valve actuating means with said valve means.

3. A stamping machine comprising a support, hammer mechanism mounted thereon and including a body, a striking element movable in the body and means for actuating the striking element, a stamping head operatively connected to the body in a position to receive the impact of the striking element, and spring means having a portion connected to the body and another portion connected to the head against movement relative thereto, for securing the head to the body, said spring means being yieldable in the direction of impact of the striking element against the head and being pre-loaded to prevent rebound of the head.

4. In a stamping machine, a support, hammer means including a body mounted on said support, a striking element movable in the body and means for actuating said striking element, and a stamping head comprising a yoke and a shank, said shank extending into the body for movably supporting the head on the body and for receiving the impact of said striking element, and a stamping die mounted on the head.

5. A stamping machine for impressing indicia on a work piece, comprising: a support, said support including a base and a column providing a space extending upwardly therefrom; fluid actuated hammer mechanism, including a cylinder having a substantially horizontal axis, mounted adjacent the upper end of said column and over the forward portion of said base; a striking element movable in said cylinder; means including a stamping head movably mounted for operation by said element; the location of said hammer mechanism over the forward portion of the base serving to create a force opposing overturning of the machine by a force urging the work piece against the stamping head; said hammer mechanism including a control valve having an operating member; an arm pivotally mounted within said column adjacent said mechanism and adapted to engage said member upon movement in one direction; an actuating member pivotally mounted intermediate its ends in said base and having a portion projecting therefrom; and rigid means within said column operatively connecting said arm and said member at the end opposite said portion, the weight of said means urging said portion upwardly and said arm in a direction away from said operating member.

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