United States Patent [19]

Hayakawa

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[45] **June 3, 1975**

[54] **MARKING PRESS DEVICE**

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[21] Appl. No.: **430,087**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 263,432, June 16, 1972, abandoned.

[30] **Foreign Application Priority Data**

June 17, 1971 Japan 46-43435

[52] **U.S. Cl.** **101/4;** 101/35; 101/41; 101/316

[51] **Int. Cl.** **B44b 5/00**

[58] **Field of Search** 101/3, 4, 9, 35, 41–44, 101/287, 316

[56] **References Cited**

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[57] **ABSTRACT**

A marking press device for impressing identification marks upon iron slabs or plates manufactured upon an iron manufacture production line, comprising a truck or carriage capable of moving forwardly toward a plate to be marked, a marking press mechanism supported by the truck and capable of moving relative to the truck a predetermined distance by an auxiliary driving mechanism, reciprocable pistons fitted within cylinders of the marking press mechanism, and marking elements also fitted within the cylinders and actuated by the pistons. Reciprocal drive means retract the truck away from the plate at the conclusion of the marking operation, as well as move such forwardly again for the next operation, and the apparatus also includes means for automatically stopping the marking press mechanism at a predetermined position relative to the slab to be marked as well as means for automatically adjusting the position of the marking press mechanism whereby the marking element will be perpendicular to the surface of the slab upon which the marked indicia will be impressed.

9 Claims, 7 Drawing Figures

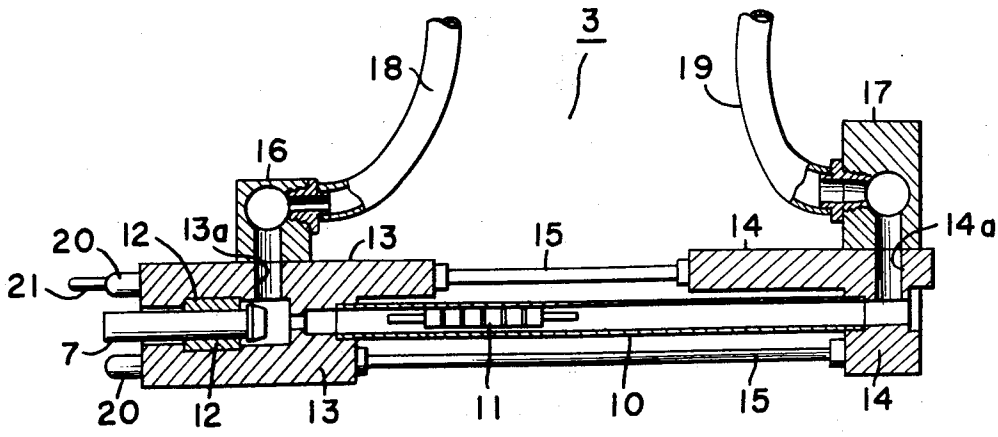


FIG. 1

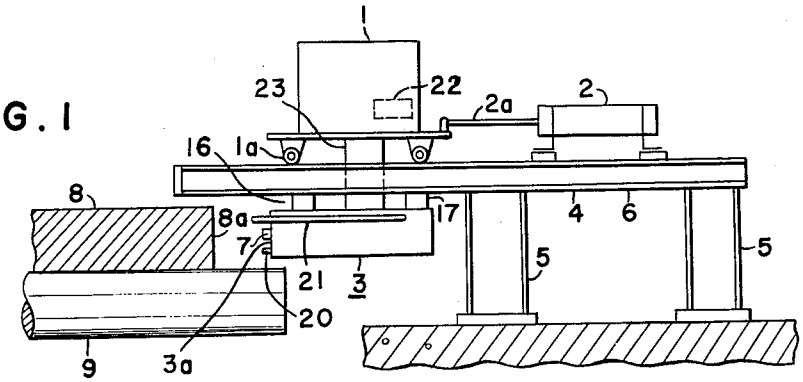


FIG. 2

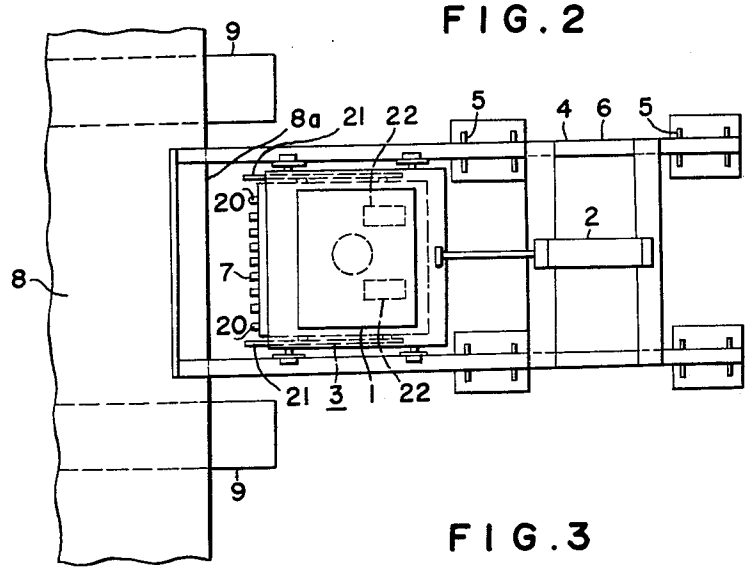


FIG. 3

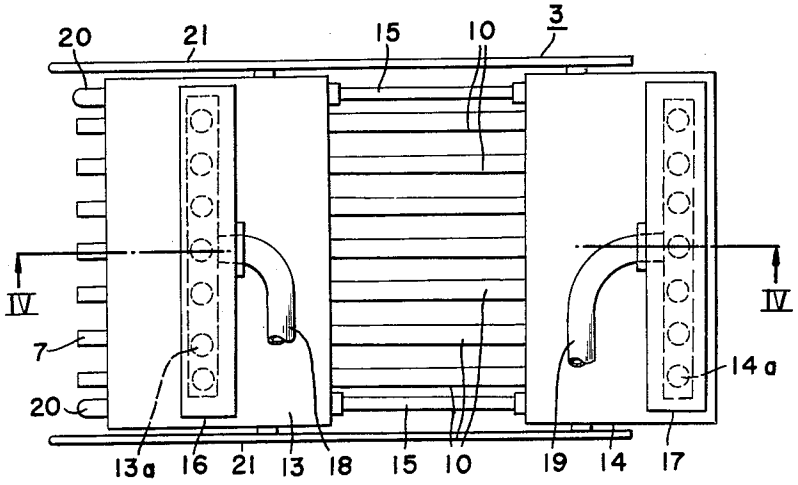


FIG. 4

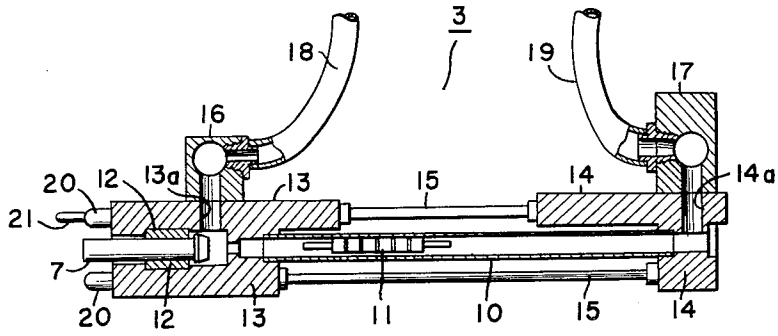


FIG. 5

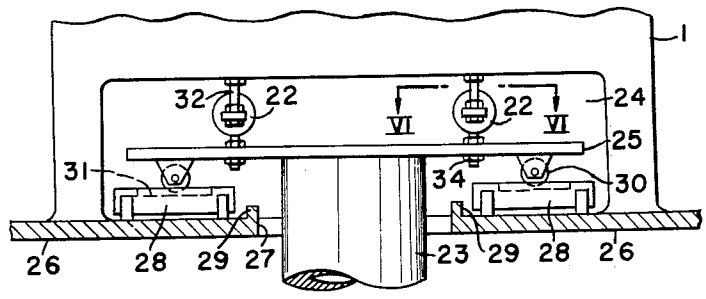


FIG. 6

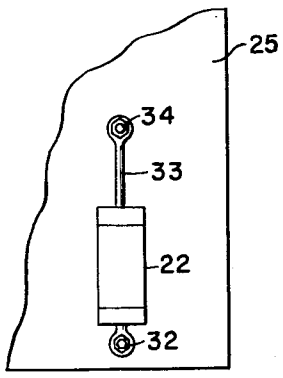
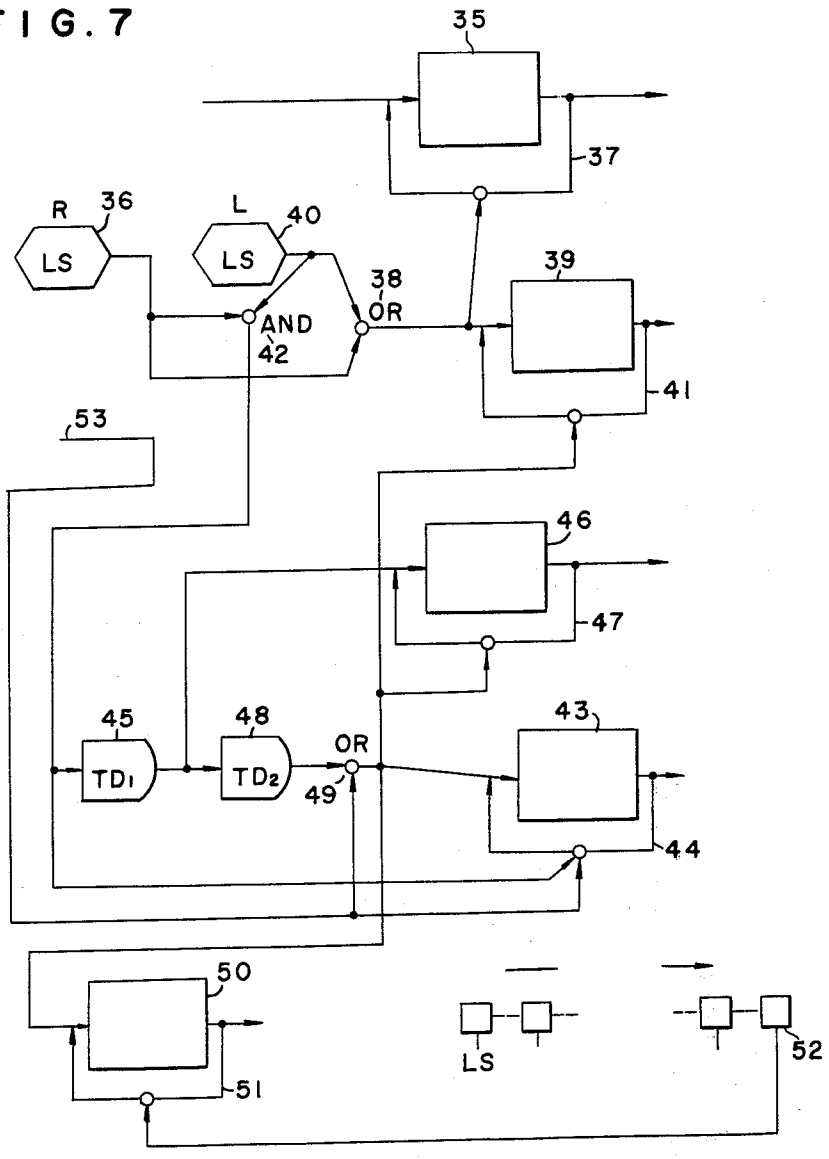


FIG. 7


35
37
R
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LS
L
40
LS
38
OR
AND
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TD1
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TD2
OR
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LS
52

MARKING PRESS DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

This is a Continuation-In-Part of application Ser. No. 263,432, filed June 16, 1972, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates generally to marking presses and more particularly to an improved marking press device for marking a figure or other identification mark upon a surface of a slab or a metal plate, such as are produced in an iron manufacturing production line.

2. Description of the Prior Art:

Heretofore, iron slabs or plates, produced for example in an iron manufacture production line, have been marked with identification numbers or other marks by an operator wearing a heat resistant mask, the operator speedily inscribing the mark with a special rod containing a chalk prepared from a specific pigment, while the slab is heated to high temperatures, such as, for example, 1,000°C.

Such conventional operations have been quite dangerous however, and have also caused great fatigue to the operators due to the great amounts of heat which radiate from the super heated slabs, and also, because of the number of operations run by the operators over extended periods of time.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved marking press device for mechanically marking a slab or a metal plate or the like which accomplishes such marking by a simple and rapid operation.

Another object of the present invention is to provide an improved marking press device which will mark a slab or metal plate clearly and accurately.

Still another object of the present invention is to provide an improved marking press device for marking a slab or a steel plate or the like which mechanically marks the plate while such is heated in an operation which is both easy and safe.

Yet another object of the present invention is to provide a marking press device for marking a slab or a steel plate or the like wherein the marking press mechanism is easily adjustable so as to be perpendicular to the marking face of the plate being marked even though the marking press device is not perpendicular to the marking face.

It is a further object of the present invention to provide a marking press device for marking a slab or a metal plate or the like wherein an irregular or load force, resulting from an uneven marking surface, such as, for example, a slab, can be prevented from being transmitted to the marking press mechanism due to the mark pressing mechanism being adjustable so as to be perpendicular to the marking face of the plate being marked.

The foregoing objectives are achieved according to this invention through the provision of a marking press device having a truck or carriage which is reciprocable upon guide rails, a marking mechanism supported by the truck which is translatable forwardly, rearwardly, and laterally, and which is also rotatable relative to the carriage or truck, and driving mechanisms which are

capable of driving the truck, as well as the marking mechanism relative to the truck, whereby the marking press device may be appropriately positioned and adjusted relative to the plate being marked.

BRIEF DESCRIPTION OF THE DRAWINGS

Various other objects, features, and attendant advantages of the present invention will be more fully appreciated as the same becomes better understood from the following detailed description when considered in connection with the accompanying drawings, in which like reference characters designate like or corresponding parts throughout the several views, and wherein:

FIG. **1** is a side view of a marking press device constructed according to this invention and showing its cooperative parts;

FIG. **2** is a plan view of the marking press device shown in FIG. **1**;

FIG. **3** is a partial enlarged plan view of the marking press device shown in FIG. **1**;

FIG. **4** is a partial cross-sectional view of the marking press device shown in FIG. **1** taken along the IV-IV of FIG. **3**;

FIG. **5** is a partial enlarged rear view of the main part of the truck of the marking press device shown in FIG. **1**;

FIG. **6** is a partial cross-sectional view of the marking press device shown in FIG. **1** taken along the line VI-VI of FIG. **5**; and

FIG. **7** is a schematic diagram of the control mechanism employed in conjunction with the marking press device shown in FIG. **1**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and more particularly to FIGS. **1** and **2** thereof, there is shown a marking press device comprising a truck or carriage **1** capable of rolling movement upon guide rails **4** by means of wheels **1***a*. Such movement may be accomplished by a driving mechanism, such as for example, an air cylinder **2**, the air inlet and outlet ducts for the air cylinder not being shown in the drawings, a rod **2***a* connecting the truck or carriage **1** with the air cylinder **2**. Vertical pole braces **5** are provided for supporting the guide rails **4** whereby a bridge **6** is formed.

A rectangular-shaped marking press mechanism **3** is supported from carriage or truck **1** in a suspended position and is capable of translatable movement with the truck **1**, and is also capable of movement relative to the truck **1**. Cylindrical marking elements **7** are disposed within the left marking face **3***a* of the marking press mechanism **3**, while a plate **8** to be marked, such as for example, a slab, is disposed at a level corresponding to the marking mechanism **3**, slab **8** being rollably supported upon a roller table **9**.

Mounted to both sides of the marking press mechanism **3** and projecting from the marking face **3***a* are a pair of longitudinal contact rods **21**. Such rods are spring actuated, the springs not being shown in the drawings, and when the front faces or edges of such rods are contacted by the plate **8** being marked, the contact rods **21** are pushed back against the biasing spring forces so as to actuate limit switches as will be more fully discussed hereinafter.

An auxiliary drive mechanism **22** is also provided for moving the marking press mechanism **3** predetermined

distances relative to the truck 1 by pushing or retracting the marking press mechanism in a forward or backward mode respectively. Mechanism 22 may be an air cylinder, for example, similar to the drive mechanism 2, the air inlet and outlet for the air cylinder 22 not being shown in the drawings. A vertical cylindrical coupling pole 23 suspendedly connects the body of the marking press mechanism 3 to a supporting plate 25 (see FIG. 5) of the truck or carriage 1.

Referring now to FIGS. 3 and 4, there is disclosed the structure of the marking press mechanism 3. A hammer or piston 11 is reciprocally disposed within each of a plurality of cylinders 10, the hammer 11 being actuated by various means, such as, for example, compressed air. An annular bushing 12 supports the marking elements 7 within a first block section 13 which also serves to support the front or left edges of the air cylinder 10, and perpendicularly disposed with respect to, but nevertheless connected with, cylinders 10 are a set of left air ducts 13*a*. A second block section 14 supports the rear or right edges of air cylinders 10, block section 14 also housing air ducts 14*a* disposed similarly to ducts 13*a*. As shown in FIG. 4, marking element 7 is in its extended or marking position, and it is of course apparent that the elements 7 may be retracted to a non-marking position by any one of conventional means. For example, a coil spring, not shown, may be interposed between the head portion of element 7 and the right end portion of bushing 12, or as an alternative, bushing 12 may be a resilient bushing.

Laterally disposed of block sections 13 and 14 for connecting the same together are a pair of bolt and screw assemblies 15, and a plurality of contact legs 20 project from the marking face 3*a* of the marking press mechanism 3, legs 20 being positioned in vertically aligned pairs at the lateral edges of the left end surface of block section 13. A compressed air branch 16 is disposed upon the block section 13 whereby compressed air is dividedly delivered to each cylinder 10, branch 16 being a block containing a plurality of connecting ducts corresponding to the number of cylinders 10 and being transversely disposed with respect to section 13. Similarly, another branch 17 is mounted upon the section 14. An air hose 18 is connected to branch 16, whereas an air hose 19 is similarly connected to branch 17, such air hoses being equipped through the inner part of the coupling pole 23 (See FIGS. 1 or 5) to the truck 1.

Referring now to FIG. 5, there is disclosed the structure of the slidable connection existing between the truck 1 and the marking press mechanism 3. A rectangular-shaped cavity 24 is disposed within the bottom section of the body of the truck 1, a rectangular supporting plate 25 of the marking press mechanism 3 being located within cavity 24 and being connected to the coupling pole 23 at its lower surface. An annular base plate 26 of the truck 1 has a central longitudinal slot or opening 27 through which coupling pole 23 can freely move longitudinally a predetermined distance.

Base plate 26 further includes housing flanges 29, each one of which is located near an interior edge of plate 26 defining slot 27, each flange 29 serving to define grooves which accommodate a roller bearing 28.

The supporting plate 25 is also mounted upon four roller assemblies 30 being similarly disposed about pole 23 and being accommodated within roller grooves 31 provided within roller bearings 28. Thus, roller bearings 28 permit the supporting plate 25 to move substantially forwardly and backwardly, that is in directions parallel to the guide rails 4, while the roller assemblies 30 allow the supporting plate 25 to move laterally toward the right and left, that is, perpendicularly to the guide rails 4. In addition, supporting plate 25 is rotatable about the longitudinal axis of coupling pole 23, and although the details thereof is not shown in the drawings, such rotatable mechanism and resulting movement will become more apparent hereinafter.

Referring now to FIG. 6, the auxiliary drive mechanism 22 is disclosed in detail as comprising a cylinder within which is disposed a piston having a rod 33 which is rotatably pivoted at one end to a bolt 32 which is mounted to the truck 1, and which is similarly pivoted at the other end to a bolt 34 which is mounted to the supporting plate 25 of the marking press mechanism 3. Thus the mechanism 3 may be moved relative to the truck 1 by actuation of the driving air cylinders 22.

Referring now to FIG. 7, the operation of the present invention is schematically disclosed. When the plate 8 to be marked is transferred by the roller assembly 9 towards the front of the marking press device and is stopped in front thereof, an initiation signal is given manually or by automatic mechanisms, whereby an electromagnetic valve 35 of the driving mechanism of the truck 1, such as for example, the air cylinder 2, is actuated and opened so as to actuate the air cylinder 2 such that the truck 1 is moved forwardly from its waiting position.

The marking press mechanism 3 supported by the truck 1 also approaches the plate 8 to be marked, and when either of the spring-biased contact rods 21 (hereinafter the description proceeding with respect to the right contact rod) is compressed by the plate 8, a limit switch 36 in association with the contact rod 21 is activated to its ON position, emitting an operation signal. During this period, the electromagnetic valve 35 is maintained in its actuated position. When the operation signal from the limit switch 36 reaches an OR circuit 38 and is conducted to a self-holding circuit 37, the actuation of the electromagnetic valve 35 is terminated so as to reduce the speed of the truck 1 and to stop it at a predetermined position.

Simultaneously with the above-described operation however, the signal from the limit switch 36 also actuates and opens an electromagnetic valve 39 associated with the auxiliary driving mechanism, that is, the air cylinders 22, thereby actuating the same. The marking press mechanism 3 thus begins to move, relative to the truck 1, towards the plate 8 to be marked by the operation of the air cylinders 22. As the marking press mechanism 3 is rotatably fitted with respect to the truck 1 for movement in a horizontal plane (such control mechanism not being shown in the drawings) the air cylinders 22 are accordingly operated until both the right and left pair of contact legs 20 make contact with the marking face or part 8*a* (See FIG. 1) of the plate 8 to be marked.

When the marking part 8a is not perpendicular to the marking direction, that is the direction of translatable movement of truck 1 and mechanism 3, the direction of the marking press mechanism 3 is thus rotatably adjusted so as to be perpendicular to the marking part 8. In other words, if one of the pairs of contact legs 20 contacts the marking part 8*a*, per the operation of the air cylinders 22, before the other pair does, the cylinders 22 are operated so that the marking press mecha-

nism 3 will be consequently rotated about the contact point of the contact leg 20 and the marking part 8*a*, such acting as a fulcrum, so that the other part of contact legs 20 is able to seat against the marking part 8*a*.

As the air cylinder 22 associated with the contact leg 20 which is not yet in contact with the slab is actuated, pivotable fittings 32 and 34 permit plate 25 to rotate relative to truck 1. In addition, while rollers 28 are merely slidably supported upon plate 26 in a non-confined manner, that is, they are not disposed within grooves similar to grooves 31 housing the rollers 30, the forces transmitted by cylinder 22 may result in a compound movement of rollers 28 comprising a forward component as well as a lateral component, whereby rollers 28 may traverse an arcuate movement corresponding to the rotation of plate 25 about the axis of pole 23. In addition, the compound movement is also facilitated by the lateral movement of the rollers 30 within the grooves 31 of rollers 28, and it is of course also apparent that as the non-perpendicularity of the marking press device relative to the marking plate 8 will normally comprise only several degrees, rollers 28 will move in virtually a straight line, the relative size of the arc traversed also being considered, while plate 25 does in fact rotate about pole 23. Such action prevents severe loads from being applied to the various parts of the marking press device, when for example the marking part 8*a* of the plate 8 is rough, such as for example, in the case of a slab, such consequently not permitting the first pair of contact legs 20 from sliding along face 8*a* until properly seated.

Still referring to FIG. 7, when both the right and left legs 20 thus contact the marking part 8*a*, the limit switch 40 associated with the left residual contact rod 21 is accordingly placed in the ON position. However, the electromagnetic valve 39 of the air cylinders 22 is still being actuated by a self-holding circuit 41, and therefore they do not advance the mechanism 3 any further relative to plate 8.

In addition, both operation signals of the limit switches 36 and 40 of the right and left contact rods 21 are transmitted through an AND circuit 42, and ultimately the self-holding circuit 44 of the electromagnetic valve 43 for actuating the hammers 11 rearwardly. The self-holding circuit 44 will release for actuation of valve 43 after a specific period of time after being actuated, such time being shorter than the delay time of a timer 45. Accordingly, compressed air will be charged through the air hose 18 by the electromagnetic valve 43 for retracting the hammers 11, whereby the hammers 11 are now retracted and are in the waiting position within each cylinder 10 at the right side of mechanism 3. Thus, the self-holding circuit 44 has been released, the actuation of the electromagnetic valve 43 has now terminated, and the air charge from the hose 18 has also terminated.

However, the output of the AND circuit 42 is also given to timer 45. After a specific delay time of the timer 45, that is after a waiting period associated with the hammers 11 within each cylinder 10 at the right side of the mechanism 3, the electromagnetic valve 46 for moving the hammers 11 forwardly is actuated by the output of the timer 45 which also delays the actuation of the self-holding circuit 47, and thus the high pressure of compressed air is discharged from the air hose 19 whereby the hammers 11 are moved and accelerated within each cylinder 10 toward the plate 8 to be marked, hammers 11 actuating marking elements 7 which now approach the marking part 8*a* of the plate being marked so that the appropriate figures, letters, or the like are marked upon the marking part 8*a*.

It is noted though, that the output of the timer 45 is also given to the timer 48. After the predetermined delay time of the timer 48, that is, after marking, the output of the timer 48 is given to OR circuit 49. When the output is given from OR circuit 49, the actuation of the self-holding circuit 41 of the auxiliary cylinder 22 is first released, thereby allowing the marking press mechanism to be retracted.

Secondarily, the actuation of the electromagnetic valve 46 for hammers 11 of the self-holding circuit 47 is released, and thirdly, the electromagnetic valve 43, for retracting hammers 11, of the self-holding circuit 44 is actuated, whereby the hammers 11 are retracted by continuous release of the self-holding circuit for a suitable period. Fourthly, the electromagnetic valve 50, of truck cylinder 2, for backwardly movement thereof, is actuated, whereby the holding pattern of the truck is released together with the continuous release of the self-holding circuit 51, whereby the truck 1 is retracted. It is noted that the first, second, third and fourth operations are simultaneously initiated.

Thereafter, the truck 1 supporting the marking press mechanism 3 continues to move backwardly to a specific predetermined position, where a specific limit switch located at a predetermined position of the rail is in the ON position, such actuating the self-holding circuit 51 of the truck cylinder electromagnetic valve 50 whereby the truck 1 is stopped at the specific position after appropriately reducing its speed. In this condition, the device waits the next initiation signal for marking. It is also noted that it is possible to return the truck 1 to its original condition, for awaiting the initiation signal, from a halfway condition of each part by actuation of a reset signal 53 which sets such condition when acting upon the output from the timer 48.

If it is desired to change the particular mark being impressed upon slab 8, it is possible to do so, since each marking element 7 can be withdrawn, in a horizontal direction, from the section 13 together with the bushing 12 by disconnecting a part of the connection of the marking element 7, such not being shown in the drawings.

It is also possible to provide suitable protection for the marking mechanism 3 against excessive amounts of heat, such as, for example, by covering the mechanism with a casing having water-cooled walls, such not being shown in the drawings, under the conditions where the marking press mechanism 3 is heated by the plate 8 being marked.

It is also possible to use hydraulic driving mechanisms or electric driving mechanisms instead of the compressed air cylinders of the driving mechanisms of the truck 1 as illustrated.

In addition, it is also possible to reciprocate the marking element 7 directly within the cylinder 10 for directly impressing the plate 8 instead of reciprocating the hammer 11 within the cylinder 10 as illustrated.

It may thus be seen that the marking press device of the present invention has important advantages over the known prior art structures in that the device identifies iron slabs automatically and safely, and without the generation or comsumption of excess amounts of heat.

With the incorporation of its various adjustable means, the service life of the apparatus is also prolonged, as undesirable stresses which may operate within the apparatus due to the working load being impressed, are obviated.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is to be understood, therefore, that within the scope of the appended claims the present invention may be practiced otherwise than as specifically described herein.

What is claimed as new and desired to be secured by letters patent of the United States is:

1. An automatic marking press device comprising:
a truck movably disposed upon guide rails;
marking press means supported by said truck for marking a plate;
a driving mechanism connected to said truck for moving said truck forwardly and backwardly upon said guide rails whereby said truck and said marking press means are able to be moved relative to said plate to be marked;
auxiliary driving means for moving said marking press means longitudinally, laterally, and rotatably within a horizontal plane relative to said truck whereby the relative position between said truck and said marking press means and between said marking press means and said plate to be marked may be adjusted;
means for automatically stopping said driving mechanism of said truck; and
retractable contact rod means projecting from said marking press means toward said plate to be marked and adapted to be retracted, upon contacting said plate to be marked as said marking press means is moved toward said plate to be marked by said driving mechanism, for actuating said means for automatically stopping said driving mechanism of said truck.

2. The marking press device as set forth in claim 1, wherein the marking press device further comprises:
a plurality of contact leg means mounted upon the sides of said marking press means and projecting therefrom toward said plate to be marked for contacting said plate prior to the marking operation and for controlling said auxiliary driving means for assuring the perpendicularity of said marking press means relative to said plate to be marked.

3. The marking press device as set forth in claim 2, wherein the marking press device further comprises:
a plurality of movable marking elements on said marking press means; and
means for automatically moving said movable marking elements toward said plate to be marked.

4. The marking press device as set forth in claim 3, wherein said marking element moving means comprises air cylinder devices supporting said movable marking elements.

5. The marking press device as set forth in claim 4, wherein said air cylinder devices comprise:
air cylinders;
hammer devices movably disposed in said air cylinders, and projectable therefrom so as to contact said movable marking elements; and
means for supplying compressed air to said air cylinders to drive said hammers.

6. The marking press device as set forth in claim 5, wherein said means for automatically stopping said driving mechanism further comprises:
switch means connected to said retractable contact rod means for generating an operation signal when said retractable contact rod means is retracted; and
first circuit means for receiving said operation signal from said switch means and for generating a stop signal to said driving mechanism.

7. The marking press device as set forth in claim 6 further comprising second circuit means for receiving said operation signal from said switch and for generating a signal to activate said compressed air supply means for driving said hammers away from said plate.

8. The marking press device as set forth in claim 7 further comprising first timer means for receiving said operation signal from said second circuit means and for generating an output signal for a duration of time so as to activate said compressed air supply means for driving said hammers toward said plate for marking particular indicia upon said plate.

9. The marking press device as set forth in claim 8 further comprising second timer means for receiving said output signal from said first timer means and for generating a control signal so as to activate said compressed air supply means for driving said hammers away from said plate and to activate said driving mechanism to move said truck away from said plate after completion of said marking operation.

* * * * *