United States Patent [19]

Maier

[11] **3,820,702**

[45] **June 28, 1974**

[54] **DEVICE FOR FASTENING INTERMEDIARY PLATES ON A MOLD WALL**

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[30] **Foreign Application Priority Data**

July 7, 1971 Germany 2133915

[52] **U.S. Cl.** **227/9**

[51] **Int. Cl.** **B25c 1/08**

[58] **Field of Search** 227/8, 9, 10, 11

[56] **References Cited**

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Primary Examiner—Granville Y. Custer, Jr.

Attorney, Agent, or Firm—Toren, McGeady and Stanger

[57] **ABSTRACT**

A device for fastening intermediary plates to the wall of mold includes a supporting frame formed of a pair of vertically arranged arms pivotally connected together at their upper ends and a member associated with the arms for moving them away from and toward one another. Located at the lower ends of each arm is at least one setting gun and upper and lower grippers for holding a plate prior to its attachment to the mold by the gun. The setting guns are arranged in pairs with the driving direction of the guns in each pair being disposed 180° apart. A carrier is pivotally attached to the lower end of each of the arms. The guns in each pair are each rigidly attached to a different one of the carriers and the upper gripper is also rigidly attached to the carrier. The lower gripper is arranged for pivotal movement separate from the upper gripper and it is spring biased in the driving direction of the gun mounted on the arm with which it is associated.

12 Claims, 3 Drawing Figures

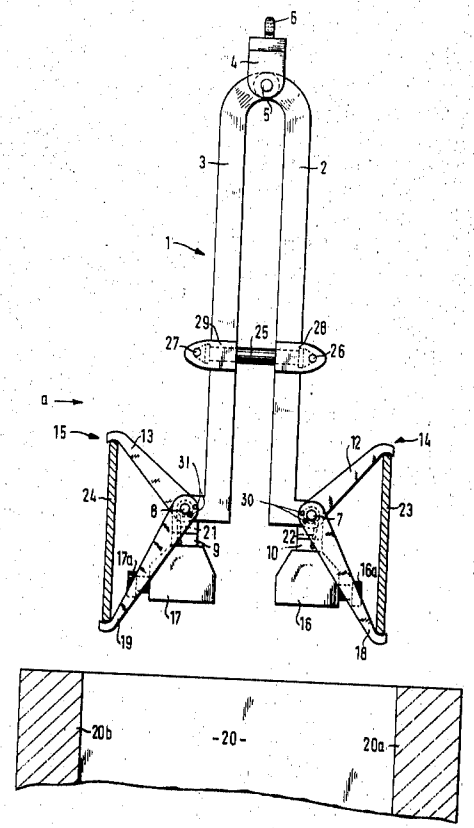
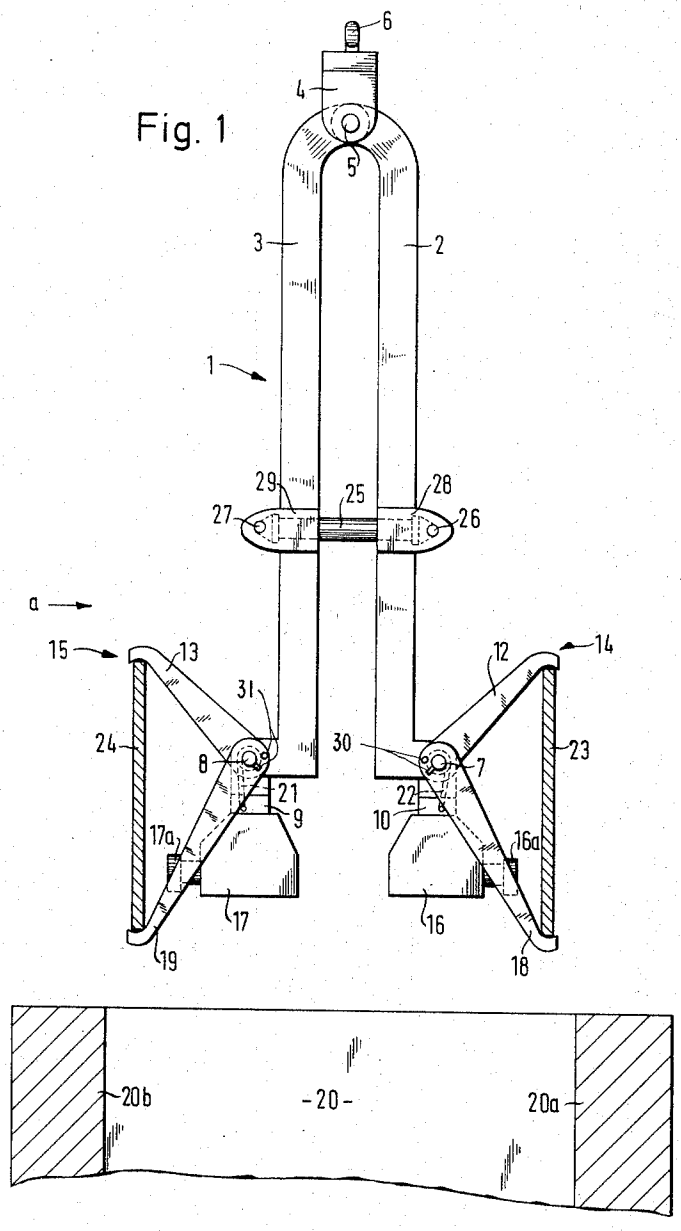


Fig. 1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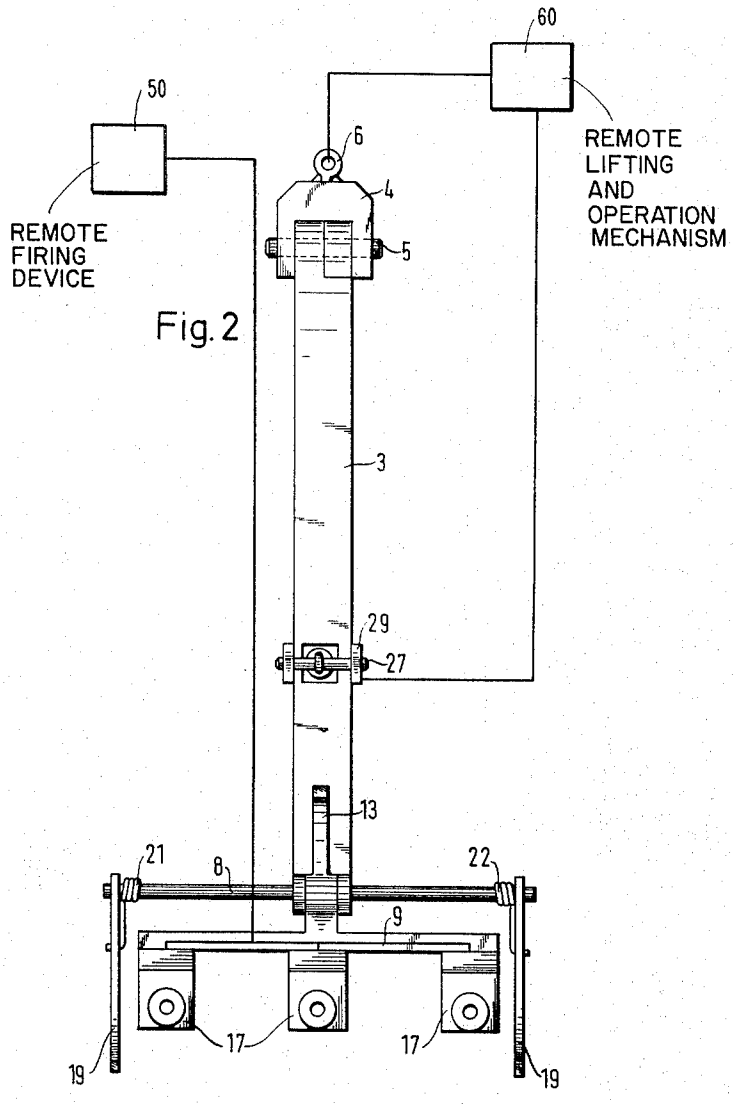
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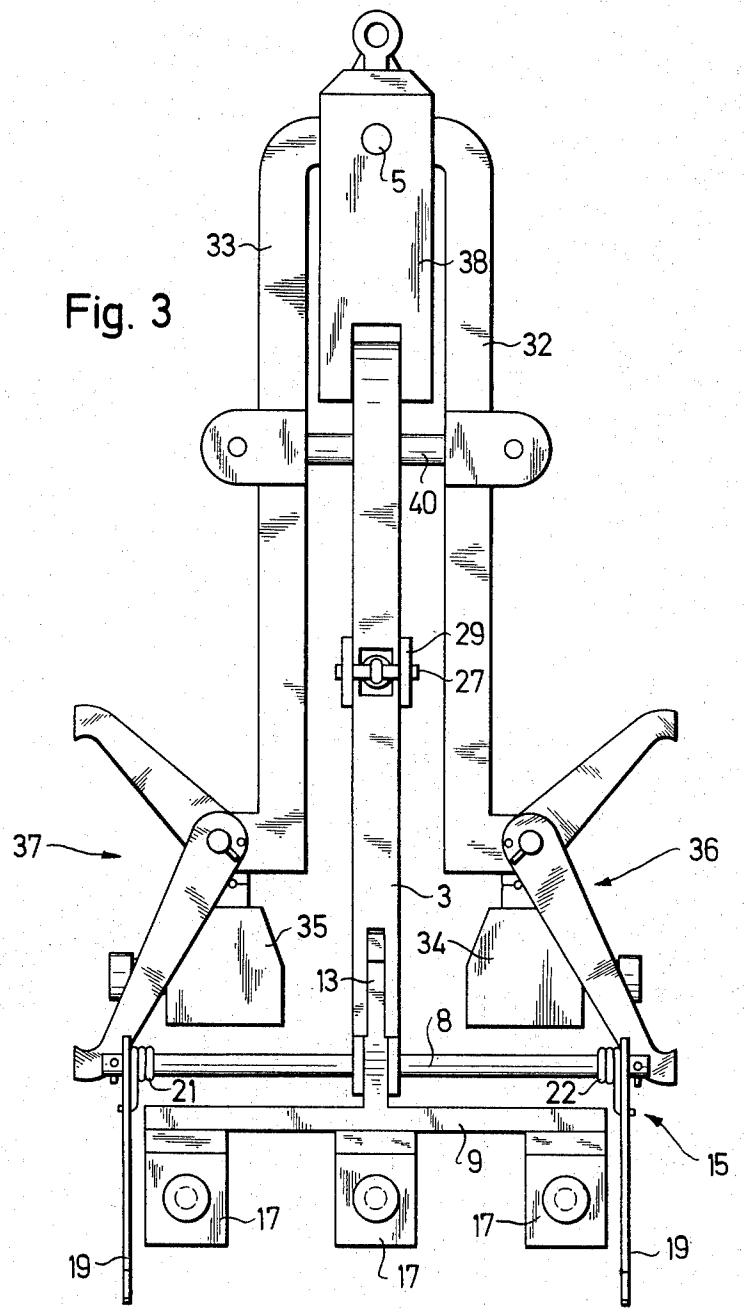
Fig. 2

Fig. 3



DEVICE FOR FASTENING INTERMEDIARY PLATES ON A MOLD WALL

SUMMARY OF THE INVENTION

The present invention is directed to a device including a supporting frame on which an explosive driven-charge gun is mounted for fastening intermediary plates to the wall of a mold and, more particularly, it is directed to a holder for supporting the plates prior to attaching them to the wall of the mold and to the arrangement of the setting guns in pairs for firing anchors in opposite directions for fixing the plates to the opposite walls of a mold.

Setting guns for fastening intermediary plates to a mold surface are known which are mounted on a supporting frame and have a holder for the plates positioned in front of the muzzle of the setting guns. The lining of a mold with the required intermediary plates takes up considerable time because, if a known gun is used, the gun must be removed from the mold after each use and introduced again into the mold for attaching the plates positioned in the holder.

As in many other steel mill operations, it is often difficult to have sufficient men available for fixing the intermediary plates to a mold. Accordingly, it is of particular importance that the operation of anchoring intermediary plates be automated.

Therefore, it is a primary object of the invention, to line a mold with the required intermediary plates in a minimum period of time.

In accordance with the present invention, one or several pairs of setting guns are mounted on a supporting frame with the guns in each pair having their driving axes in substantial alignment and with the driving directions of each gun disposed 180° apart. Further, where additional pairs of guns are arranged, the driving axes of the different pairs can be arranged parallel and/or perpendicular to one another.

By virtue of such an arrangement, the entire plate fastening operation can be reduced to a minimum number of steps, that is, it is possible to fix at least a major part of all the required intermediary plates on the mold wall in a single operation. If certain of the pairs of guns are arranged at right angles to the other pairs, it is possible to secure the intermediary plates to the mold walls simultaneously in a single securing operation.

To ensure the easy introduction of the setting guns into the mold with the intermediary plates held in position by holders, the guns are arranged in pairs movable in the direction of their driving axes. By being able to move the guns in the direction of their driving axes, it is possible to displace the guns along a pressure path for effecting safe operation of the insertion of the anchors or bolts which attach the plates to the mold. Further, a pneumatic or hydraulic working cylinder can be incorporated into the supporting device for effecting the required movement of the guns and the device can be operated by remote control from a location spaced from the mold. In place of the working cylinder, the movement of the guns can be provided by the use of an electro-motor, an electro-magnet and the like.

If the mold is small, pairs of guns arranged perpendicular to one another may get in one another's way. This problem is particularly noticeable in the corners of molds where there is a lack of sufficient working space. Therefore, where the guns are located in tight quarters, it is advantageous if the guns extending perpendicularly to one another, are arranged in spaced planes which extend perpendicularly to the direction of the supporting frame. With such an arrangement, all of the holding devices can be provided with the necessary intermediary plates when the supporting device is introduced into the mold.

Initially, the supporting device is lowered into the mold until the intermediary plates are in position for attachment to the mold surface and the driving directions of the guns in each pair are disposed 180° apart. After the first group of plates are attached to the mold, if required, the supporting device can be lowered further into the mold until the plates extending perpendicularly to the first group of plates are located in position for attachment. Therefore, it is advantageous if each of the pairs of guns disposed in parallel relationship can be fired simultaneously.

Furthermore, if the pairs of guns disposed perpendicularly to one another are all located in the same plane, such as in attaching the intermediary plates to a large sized mold, it is advantageous if all of the guns can be fired at the same time.

To provide a vertical component for the penetration of the nail into the mold wall, the guns are tiltable in a vertical plane on the supporting frame.

Another feature of the invention is the arrangement of the gripping members which form the holders for the intermediary plates. One of the gripping members is attached to a carrier which also supports the guns while the other gripping member is pivotally mounted on the supporting frame. The gripping members are located above and below the muzzle of the setting gun and are movable toward the plane of the muzzle as the gun is arranged in the firing position. With this arrangement, it is possible to obtain a closely fitting engagement of the intermediary plates with the surface of the mold, though the mold walls are uneven. Since the gripping members arranged above and below the gun can be moved toward the muzzle of the gun until it is in the firing position, the gun muzzle can be supported on the intermediary plate so that the pressure path required for safety reasons in firing the gun can be provided.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** is a side view of a device, embodying the present invention, for fastening intermediary plates to the wall surfaces of a mold;

FIG. **2** is a view, of the device shown in FIG. **1**, as seen in the direction of the arrow "*a*", and

FIG. **3** is a view similar to FIG. **2**, on an enlarged scale, illustrating another embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. **1**, a device or supporting frame **1** is formed of a pair of vertically extending and laterally spaced arms **2, 3**. At their upper ends, the arms are rotatably

mounted about a bolt **5** positioned in a shackle **4.** A suspension eye **6** is secured to and extends upwardly from the shackle **4.** Each of the arms has a pivot axis or pin **7, 8** at its lower end and a carrier **9, 10** is mounted on each of the pivot pins. Rigidly secured to each of the carriers **9, 10** is an upper gripping member **12, 13** which forms a part of the holder **14, 15** for the intermediary plates **23, 24** to be fastened to the walls of the mold **20.** In addition to the upper gripping members, a setting gun **16, 17** is rigidly connected to the carrier so that it can be pivoted with the upper gripping member about the pivot pin **7, 8.**

As can be seen in FIG. **2,** the arm **3** supports three setting guns **17** disposed in laterally spaced relationship. Each of the guns **17** has a corresponding gun **16** on the opposite carrier **10** of the arm **2** forming a pair of guns arranged in the same horizontal plane with their firing directions disposed 180° apart. The number of pairs of guns associated with the supporting frame **1** can be selected in accordance with the dimension of the mold **20** to which the intermediary plates **23, 24** are to be fastened. Furthermore, as shown in FIG. **2,** the bottom gripping members arranged at the ends of the pivot pins are biased by torsion springs **21, 22** in the driving direction of the associated guns. To limit the movement of the bottom gripping members **18, 19** caused by the torsion springs **21, 22,** stops **30, 31** are arranged on the pivot pins **7, 8** and the bottom gripping members.

In FIG. **1,** a working cylinder **25,** such as a hydraulic or pneumatic cylinder, is pivotally connected by means of pivot bolts **26, 27** to flanges **28, 29** on the arms **2, 3.** The working cylinder **25** is located intermediate the ends of the arms and can displace the arms outwardly away from and inwardly toward one another.

To clarify the invention as illustrated in FIGS. **1** and **2,** only a portion of the device is shown having several pairs of guns arranged in parallel with one another, that is the driving axes of the guns are arranged parallel to one another and in the same horizontal plane. However, as shown in FIG. **3** the device can be provided with two additional arms **32, 33** for supporting setting guns **34, 35** and the plate holders **36, 37** oriented at right angles to the arrangement of the setting guns **16, 17** and plate holders **14, 15** shown in FIGS. **1** and **2,** that is for securing intermediary plates to the surfaces of the mold **20** disposed perpendicularly to the sides **20***a*, **20***b* of the mold. Where two groups of setting guns are arranged with perpendicular driving axes, as shown in FIG. **3,** instead of the shackle **4,** a head bearing **38** is used with two vertically spaced pivot bolts **5,** one for each pair of arms **2, 3** and **32, 33.** In the event the mold is of a relatively small size, it is advantageous if the setting guns having their driving axes disposed perpendicular to one another, are located in vertically spaced planes as illustrated in FIG. **3.**

In using the device shown in FIGS. **1** and **2,** initially, the guns **16, 17** are provided with explosive cartridges and fastening members, and the intermediary plates **23, 24** are inserted into the holders **14, 15** formed by the upper gripping members **12, 13** and the lower gripping members **18, 19** so that, preferably, a three-point support is provided. The device or supporting frame **1** is suspended on a remote lifting and operating mechanism **60** so that the device can be lowered into and lifted out of the mold **20.** The supporting frame is lowered into the mold **20** until the intermediary plates **23, 24** have reached the desired location for fastening to the walls of the mold. With the plates properly positioned, the working cylinders **25** are actuated over the mechanism **60** and the arms **2, 3** are moved apart for displacing the plates **23, 24** and the guns **16, 17** toward the mold walls **20***a*, **20***b*. As the arms move away from one another, the lower gripping members **18, 19** are the first to contact the mold walls and, in reaction, move rearwardly toward the plane of the muzzles **16***a*, **17***a* of the guns. As the outward movement continues, the intermediary plates **23, 24** are pressed by the upper gripping members **12, 13** and the muzzles **16***a*, **17***a* of the guns against the mold walls. By the continued pressing of the muzzles of the guns against the intermediary plates and the further retraction of the lower gripping members, the muzzles of the guns traverse a pressure path provided for safety reasons so that the guns are in the firing position and the fastening members can be driven through the plates into the mold walls. By a known remote firing device **50,** note FIG. **2,** connected to the guns **16, 17** simultaneous firing can be achieved. With the plates attached to the mold walls, the working cylinder **25** is reversed and it displaces the arms **2, 3** toward one another and withdraws the guns **16, 17** toward the center of the mold. If all of the mold plates have been attached in one operation, then the device can be removed from the mold, or if additional pairs of guns are arranged in a second plane spaced vertically from the plane of the guns initially fired, as in FIG. **3,** the second guns **34, 35** can be lowered, along with the plates to be attached, downwardly into the mold and the procedure outlined above can be repeated for completing the attachment of all the plates to the mold surface.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. Device for fastening intermediary plates to the walls of a mold includes a supporting frame, explosion charge-driven setting means mounted on said supporting frame for driving fastening members for anchoring the plates to the mold, and holders mounted on said supporting frame for holding the plates as they are moved into position for attachment, wherein the improvement comprises means for remotely positioning said supporting frame within the mold, and said setting means includes at least a first pair of setting guns with the driving axes of said first pair of setting guns disposed in parallel relationship and the driving directions of said guns in said pair disposed 180° apart.

2. Device, as set forth in claim **1,** wherein said setting means includes a second pair of setting guns having the driving axes thereof disposed in parallel relationship with the driving axes of said first pair of setting guns.

3. Device, as set forth in claim **2,** wherein the driving axis of said setting guns in each said pair are disposed substantially in axial alignment.

4. Device, as set forth in claim **3,** wherein means are associated with said supporting frame for movably displacing said guns within each said pair in the direction of their driving axes.

5. Device for fastening intermediary plates to the walls of a mold includes a supporting frame, explosion

charge-driven setting means mounted on said supporting frame for driving fastening members for anchoring the plates to the molds, and holders mounted on said supporting frame for holding the plates as they are moved into position for attachment, wherein the improvements comprises that said setting means includes at least a first pair of setting guns with the driving axes of said first pair of setting guns disposed in parallel relationship and the driving directions of said guns in said pair disposed 180° apart, and said setting means includes at least a second pair of setting guns with the driving axes thereof disposed in parallel relationship to the driving axes of said first pair of setting guns and with the driving directions of said guns in said second pair disposed 180° apart, the driving axes of said setting guns in each said pair are disposed substantially in axial alignment, means associated with said supporting frame for movably displacing said guns within each said pair in the direction of their driving axes, said supporting frame comprises at least a pair of dependently supported holding members, in each of said pair of guns each said gun is supported on a different one of said holding members, and said means associated with said support frame comprises a working cylinder secured to said holding members for effecting relative displacement between said holding members and displacement of said guns in each said pair thereof in opposite directions.

6. Device, as set forth in claim **1,** wherein said setting means includes a second pair of setting guns with the driving axes thereof disposed in perpendicular relationship to the driving axes of said first pair of setting guns.

7. Device, as set forth in claim **6,** wherein said second pair of guns disposed perpendicularly to said first pair of guns are arranged in spaced planes which planes extend perpendicularly to said supporting frame.

8. Device, as set forth in claim **1,** wherein said supporting frame comprises a pair of horizontally arranged pivot pins, said guns in said first pair each mounted on a different one of said pivot pins for pivotal displacement in a vertical plane.

9. Device, as set forth in claim **1,** wherein said holders comprise at least one upper gripping member positioned above said guns and at least one lower gripping member positioned below said guns, said upper and lower gripping members arranged for displacement from a position for holding an intermediary plate prior to the fastening of the plate to the wall of the mold located forwardly of the muzzle of said guns toward the muzzle of said guns.

10. Device for fastening intermediary plates to the walls of a mold includes a supporting frame, explosion charge-driven setting means mounted on said supporting frame for driving fastening members for anchoring the plates to the mold, and holders mounted on said supporting frame for holding the plates as they are moved into position for attachment, wherein the improvement comprises that said setting means includes at least a first pair of setting guns with the driving axes of said first pair of setting guns disposed in parallel relationship and the driving directions of said guns in said pair disposed 180° apart, said setting means includes at least a second pair of setting guns with the driving axes thereof disposed in parallel relationship to the driving axes of said first pair of setting guns and the driving directions of said guns in said second pair disposed 180° apart, said supporting frame comprises a pair of vertically extending laterally spaced arms pivoted together with the upper ends thereof, a horizontally arranged pivot pin at the lower end of each of said arms, a carrier pivotally mounted on each of said pivot pins, said first pair of guns and said second pair of guns each having one said gun of said pair rigidly connected to one of said carriers and the other one of said guns of said pair rigidly connected to the other said carrier, said holders comprising an upper gripping member and at least one lower gripping member associated with each of said arms, said upper gripping member being rigidly secured to said carrier and said lower gripping member being pivotally mounted on said pivot pin, spring means mounted on said pivot pin for biasing said lower gripping members in the driving direction of said guns, and means associated with said arms for biasing said arms away from and toward one another for moving said holders and said guns into and out of position for attaching the plates to the wall of the mold.

11. Device, as set forth in claim **10,** wherein said means for biasing said arms comprises a working cylinder pivotally connected to each of said arms intermediate the upper and lower ends thereof.

12. Device, as set forth in claim **10,** wherein each of said carriers support a number of said guns with the driving axis of said guns disposed in spaced apart relationship and in the same horizontal plane.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,820,702 Dated June 28, 1974

Inventor(s) Elmar Maier

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the patent:

The name and address of the assignee

should read:

--Hilti Aktiengesellschaft,

Schaan, Fuerstentum Liechtenstein--.

Signed and sealed this 22nd day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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☆ U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.