Aug. 11, 1942. T. H. HEATH 2,292,635

DOUBLE ACTING PUNCH

Filed May 24, 1939 2 Sheets-Sheet 1

Fig. 1.

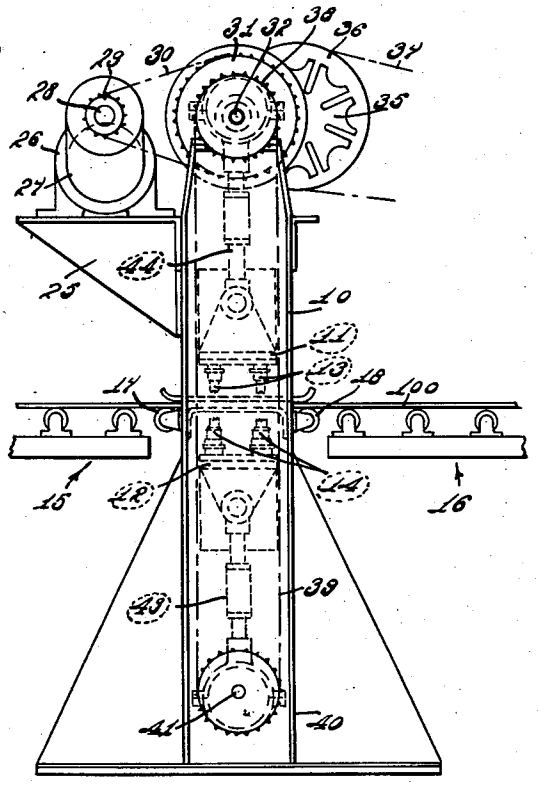


Fig. 3.

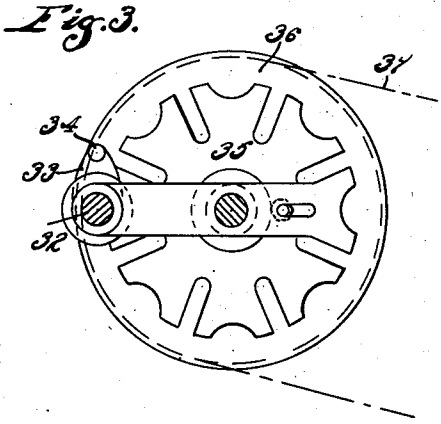
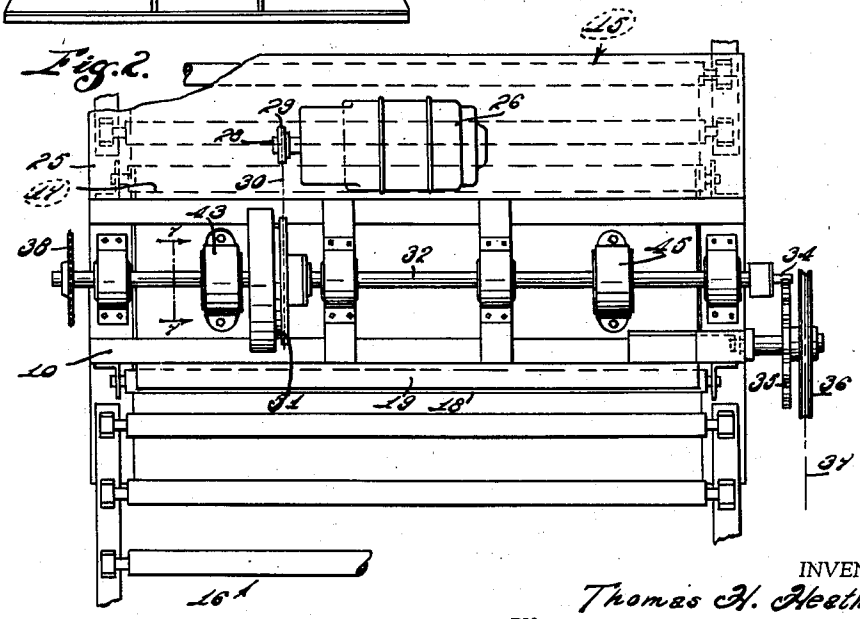


Fig. 2.



INVENTOR.
Thomas H. Heath,
BY
Hood & Hahn.
ATTORNEYS

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Fig. 4.

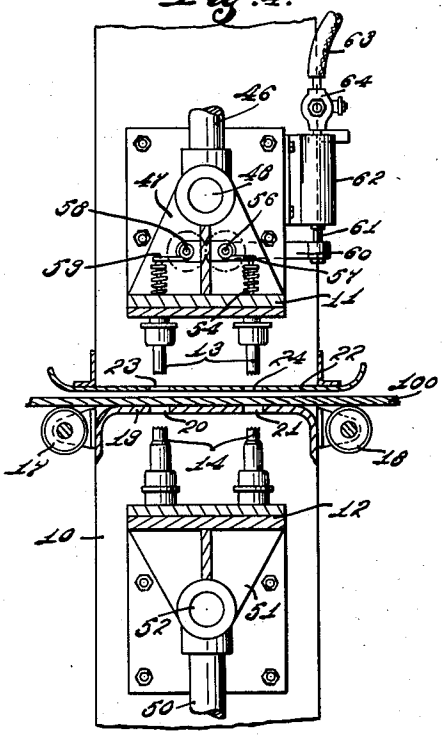


Fig. 5.

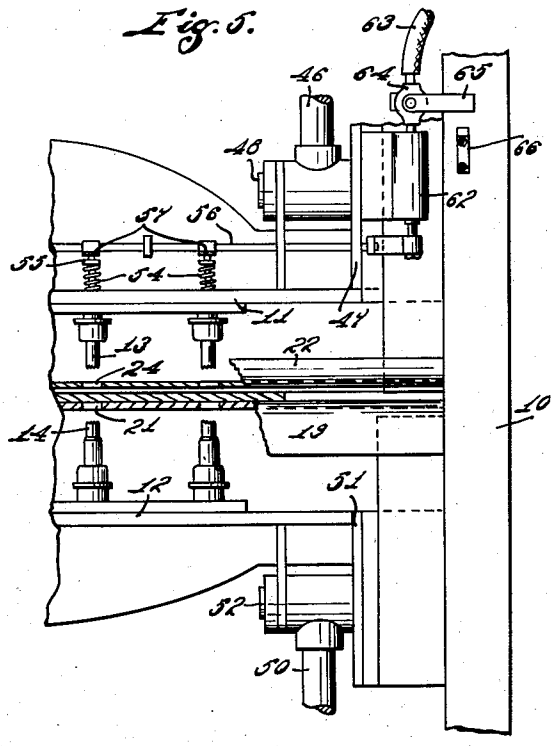


Fig. 6.

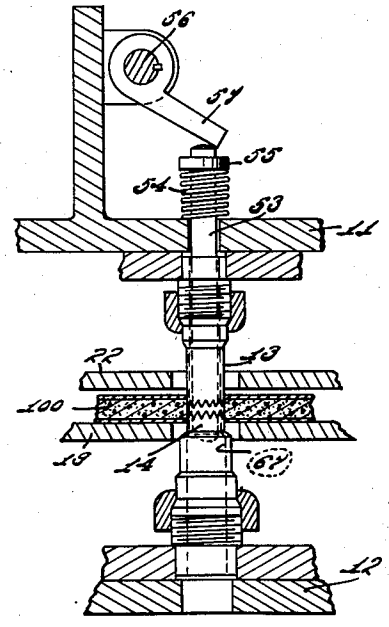
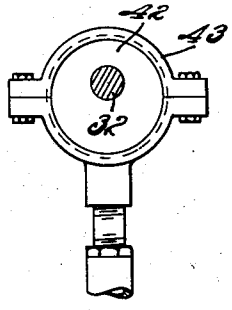


Fig. 7.



INVENTOR.
Thomas H. Heath,
BY
Hood & Hahn.
ATTORNEYS.

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UNITED STATES PATENT OFFICE

2,292,635

DOUBLE ACTING PUNCH

Thomas H. Heath, Enterprise, Kans., assignor to The J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kans., a corporation of Kansas

Application May 24, 1939, Serial No. 275,331

12 Claims. (Cl. 164—90)

The present invention relates to the art of perforating plaster board, and is particularly concerned with forming perforations in such material by the action of rectilinearly moving punches. The primary object of the invention is to provide a machine for perforating such material which is applicable either to unset plaster board or to partially set plaster board or to finally set and dried plaster board, although its advantages are most apparent when used in connection with unset plaster board. More particularly, it is an object of the invention to perforate plaster board or the like by the joint action of two oppositely facing, alined, hollow punches which move, substantially simultaneously, to penetrate the material substantially simultaneously from its opposite surfaces, whereby the paper binders forming the opposite outer surfaces of the board are substantially simultaneously cut, the punches subsequently penetrating into the plaster body of the board, whereafter a slug of board material having a cross sectional area defined by the interior cross section of the hollow punches and an extension thereof, is forced to move entirely into one of the punches, and the punches are withdrawn from the sheet of material. Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific construction illustrated and described, so long as the scope of the appended claims is not violated.

Fig. 1 is a side elevation of a mechanism embodying the apparatus of the present invention and capable of carrying out the method contemplated;

Fig. 2 is a plan view thereof, parts being broken away for clarity of illustration;

Fig. 3 is a sectional enlargement of a detail of the machine;

Fig. 4 is an enlarged fragmentary section taken upon a plane parallel to the plane of Fig. 1;

Fig. 5 is a fragmentary elevation of the mechanism illustrated in Fig. 4;

Fig. 6 is an enlarged sectional view of a detail of the mechanism; and

Fig. 7 is an enlarged fragmentary section taken substantially on the line 7—7 of Fig. 2.

Referring more particularly to the drawings, it will be seen that I have illustrated a machine comprising a frame or standards 10 in which are reciprocably mounted two punching heads 11 and 12. The punching head 11 carries two series of punches 13 facing downwardly, while the head 12 carries two series of punches 14, each of the punches carried by one of said heads being alined with a corresponding punch carried by the other of said heads. The cutting ends of the punches used are preferably of the character disclosed in the patent to William J. Ehrsam, No. 2,182,744 issued December 5, 1939, each of said punches being hollow and formed at its leading end with a plurality of cutting teeth.

Conveyor means indicated generally by the reference numerals 15 and 16 are positioned to support a sheet 100 of plaster board or the like and to move such sheet in a desired manner across the supporting rollers 17 and 18. In the particular embodiment herein illustrated, the board will be moved intermittently, being stopped during periods when the punches are engaged with the board.

A stripper plate 19, formed with perforations 20 and 21 through which the punches 14 may pass, aids the rollers 17 and 18 in supporting the section of board currently being operated upon; and a corresponding stripper plate 22, provided with perforations 23 and 24 through which the punches 13 may be projected, is positioned closely above that section of the board which is supported upon the plate 19.

A bracket 25 supports a motor 26 with which is associated a conventional gear reduction 27, the output shaft 28 of which carries a sprocket 29 which, through a chain 30, drives a sprocket 31 suitably operatively connected to drive a shaft 32 supported in the upper portions of the frame members 10.

At one end, said shaft 32 carries outboard an arm 33 terminating in a finger 34, said arm and finger cooperating with a Geneva gear 35 mounted adjacent the shaft 32 to drive a sprocket 36 which, through a chain 37, drives the operating mechanism (not shown) for the live rolls of the intermittently-actuated conveyor means 15, 16. It will be obvious that, upon each rotation of the shaft 32, the Geneva wheel 35 will be advanced one step, and then will be stopped during that portion of the rotating cycle of the shaft 32 during which the punches 13 and 14 are engaged in the material being worked upon.

The shaft 32 likewise carries outboard a sprocket 38 which, through a chain 39, drives a sprocket 40 mounted upon a shaft 41 which is journalled, near the base of the frame members 10, in parallelism with the shaft 32.

The shaft 32 is formed or otherwise provided with a plurality of eccentrics, only one of which, 42 (see Fig. 7), is illustrated. A bearing 43 at the upper end of a pitman 44 is mounted upon the eccentric 42; and a similar bearing 45 at the upper end of a pitman 46 is similarly mounted upon another eccentric formed on the shaft 32. The lower ends of said pitmans 44 and 46 are suitably journalled in brackets formed on the punching head 11, whereby said head is supported from the shaft 32. In Fig. 4, it will be seen that the lower end of the pitman 46 is connected by trunnion 48 with the bracket 47 of the punching head 11; so that, upon each rotation of the shaft 32, the punching head 11 will be moved through one complete reciprocatory cycle.

The shaft 41 is formed with eccentric similar to the eccentric 42, upon which are mounted the bearings at the lower ends of pitmans 49 and 50, the upper ends of said pitmans supporting the punching head 12. In Fig. 4, I have illustrated the trunnion 52 journalled in the bracket 51 of the punching head 12, whereby said head is supported.

The shafts 41 and 32 and their respective eccentrics are so designed, proportioned, and adjusted that the cycles of the two punching heads 11 and 12 are substantialy simultaneous, equal, and opposite; so that the punches 13 and the punches 14 will substantially simultaneously cut the opposite outer surface binders of the sheet 100, and will thereafter penetrate the body of said sheet.

Reciprocably mounted within each of the punches 13 is a plunger 53, the same normally being held, by a spring 54 engaged between the head 11 and a collar 55, in a position such that its lowermost end is spaced upwardly from the toothed mouth of the punch 13 a distance at least equal to one-half the thickness of the material being operated upon. A rock shaft 56 is suitably journalled on the head 11 and carries a plurality of projecting fingers 57, each of which is operatively associated with the upper end of a plunger 53. A second rock shaft 58, parallel with the rock shaft 56, carries a series of fingers 59, each of which is associated with the upper end of a plunger associated with one of the other series of punches 13; and the two rock shafts 56 and 58 are suitably coordinated so that they move equally and oppositely, as by meshing gears carried by the respective shafts. A lever 60 is connected to the rock shaft 56, the projecting end of said lever being operatively associated with the projecting stem 61 of the piston of a fluid motor 62 carried upon the head 11. A suitable source of fluid under pressure (not shown) is connected, by a flexible tube 63, and through a valve 64, to supply fluid under pressure to said motor 62. The valve 64 is of a well known supply-exhaust type and is provided with an operating handle 65. When the handle 65 is in the position illustrated in Fig. 5, the interior of the motor 62 is open to the atmosphere; but, when said handle 65 is moved in a counter-clockwise direction from the position of Fig. 5, communication between the interior of said motor 62 and the atmosphere is broken, and a flow path for fluid from the conduit 63 to flow into the motor 62 is established. A bracket 66 is so positioned upon one of the frame members 10 that, as the two heads 11 nd 12 approach a position in which the punches 13 and 14 are at maximum proximity, the handle 65 will engage said element 66 to be moved in a counter-clockwise direction from the position of Fig. 5. Thereupon, fluid is admitted to the motor 62 to project the piston stem 61 to rotate the shafts 56 and 58 to depress the plungers 3, moving said plungers into the position of Fig. 6 wherein, as it will be seen, the lowermost end of each plunger has entered the corresponding punch 14.

The result of this operation is that, as the respective punches 13 and 14 contact the opposite outer surfaces of the board, the punch teeth cut the paper binders with a slicing action to form clean holes therein, and then begin to penetrate the body of the board. As the punches approach the position of Fig. 6, the motor 62 is actuated to swing the fingers 57 and 59 to project the plungers 53, and said plungers, engaging the upper surfaces of the plugs of board material defined by the inner surfaces of the punches 13 and 14 and an intermediate extension of said surfaces, force said plugs downwardly out of the punches 13 and into the punches 14. From an inspection of Fig. 6, it will be seen that the interior of each punch 14 is enlarged as at 67, and the action of the plungers forces the plugs into those enlarged portions, whence the plugs may drop out to fall upon the floor or, if desired, into suitable containers (not shown).

I claim as my invention:

1. In a plaster board perforating machine, two alined, hollow punches disposed in facing relation, means for substantially simultaneously reciprocating said punches in opposite directions, a plunger reciprocably mounted within one of said punches, means for reciprocating said plunger to project the same beyond that end of said punch facing the other of said punches, and means fixed against reciprocatory movement with respect to said one punch and engageable only at certain times in the cycle of the machine with a non-reciprocating member to actuate said plunger-reciprocating means.

2. In a plaster board perforating machine, two alined, hollow punches disposed in facing relation, means for substantially simultaneously reciprocating said punches in opposite directions, a plunger reciprocably mounted within one of said punches, means for reciprocating said plunger to project the same beyond that end of said punch facing the other of said punches, and means fixed against reciprocatory movement with respect to said one punch and engageable with a non-reciprocating member, only as said two punches approach maximum proximity, to actuate said plunger-reciprocating means to project said plunger into the other of said punches.

3. In a machine for perforating plaster board or the like, two alined, hollow punches disposed in facing relation, means for substantially simultaneously reciprocating said punches in opposite directions, a plunger reciprocably mounted within one of said punches, means resiliently holding said plunger within said one punch, a rock shaft, a finger fixed to said rock shaft and operatively associated with said plunger, and means operable upon reciprocation of said punches to a predetermined proximity to oscillate said rock shaft to move said plunger, against the tendency of said resilient means, and to project the same beyond the end of said one punch.

4. In a machine for perforating plaster board or the like, two alined, hollow punches disposed in facing relation, means for substantially simultaneously reciprocating said punches in opposite directions, a plunger reciprocably mounted within one of said punches, means resiliently holding

said plunger within said one punch, a rock shaft, a finger fixed to said rock shaft and operatively associated with said plunger, an arm operatively associated with said rock shaft, a fluid motor operatively connected to said arm to oscillate said rock shaft, a source of fluid under pressure, and means operable upon movement of said one punch to a predetermined degree, to supply fluid to said motor, whereby said rock shaft is oscillated to project said plunger, against the tendency of said resilient means, beyond the end of said one punch.

5. In a machine for perforating plaster board or the like, two alined, hollow punches disposed in facing relation, means for substantially simultaneously reciprocating said punches in opposite directions, a plunger reciprocably mounted within one of said punches, means resiliently holding said plunger within said one punch, a rock shaft, a finger fixed to said rock shaft and operatively associated with said plunger, a motor operatively connected to oscillate said rock shaft, and means operable upon movement of said punches to predetermined proximity, to energize said motor to oscillate said rock shaft to project said plunger, against the tendency of said resilient means, beyond the end of said one punch.

6. In a machine for perforating plaster board or the like, a hollow punch, means for reciprocating said punch, a plunger reciprocably mounted within said punch, resilient means holding said plunger within said punch, a rock shaft movable with said punch, a finger fixed on said shaft and operatively associated with said plunger, and means operable by reciprocation of said plunger to a predetermined degree to oscillate said rock shaft to cause said finger to project said plunger beyond the end of said punch.

7. In a machine for perforating plaster board or the like, a hollow punch, means for reciprocating said punch, a plunger reciprocably mounted within said punch, resilient means holding said plunger within said punch, a rock shaft movable with said punch, a finger fixed on said shaft and operatively associated with said plunger, a motor operatively connected to oscillate said shaft, upon energization, and means operable upon reciprocation of said punch to a predetermined position to energize said motor to oscillate said rock shaft to cause said finger to project said plunger beyond the end of said punch.

8. In a machine for perforating plaster board or the like, a punching head, means for reciprocating said head, a plurality of hollow punches carried by said head in a transverse line, a rock shaft carried by said head and substantially parallel with said line, a plunger reciprocably mounted within each of said punches, resilient means holding each plunger within its punch, a plurality of fingers fixed on said rock shaft, one finger being operatively associated with each plunger to project the same, upon oscillation of said shaft, beyond the end of its punch against the tendency of said resilient means, and means operable by reciprocation of said head to a predetermined degree, to oscillate said rock shaft.

9. In a machine for perforating plaster board or the like, a punching head, means for reciprocating said head, a plurality of hollow punches carried by said head in a transverse line, a rock shaft carried by said head and substantially parallel with said line, a plunger reciprocably mounted within each of said punches, resilient means holding each plunger within its punch, a plurality of fingers fixed on said rock shaft, one finger being operatively associated with each plunger to project the same, upon oscillation of said shaft, beyond the end of its punch against the tendency of said resilient means, a motor operatively connected to oscillate said shaft, upon energization, and means operable, upon reciprocation of said head to a predetermined position, to energize said motor.

10. In a machine for perforating plaster board or the like, a punching head, means for reciprocating said head, a plurality of hollow punches carried by said head in a transverse line, a rock shaft carried by said head and substantially parallel with said line, a plunger reciprocably mounted within each of said punches, resilient means holding each plunger within its punch, a plurality of fingers fixed on said rock shaft, one finger being operatively associated with each plunger to project the same, upon oscillation of said shaft, beyond the end of its punch against the tendency of said resilient means, means operable by reciprocation of said head to a predetermined degree, to oscillate said rock shaft, a second series of hollow punches carried by said head in a transverse line, a second rock shaft carried by said head substantially parallel with said last-named line, a plunger reciprocably mounted within each of said second series of punches, resilient means holding each of said last-named plungers within its punch, a plurality of fingers fixed on said second rock shaft, one of said last-named fingers being operatively associated with each of said last-named plungers to project the same, upon oscillation of said second rock shaft, beyond the end of its punch against the tendency of said resilient means, and means operatively connecting said two rock shafts to oscillate equally and oppositely.

11. In a plaster board perforating machine, two alined, hollow punches disposed in facing relation, means for substantially simultaneously reciprocating said punches in opposite directions, a plunger reciprocably mounted within one of said punches, means for reciprocating said plunger to project the same beyond that end of said punch facing the other of said punches, and means fixed against reciprocatory movement with respect to said one punch and engageable with a stationary member at times to actuate said plunger-reciprocating means.

12. In a plaster board perforating machine, two alined, hollow punches disposed in facing relation, means for substantially simultaneously reciprocating said punches in opposite directions, a plunger reciprocably mounted within one of said punches, means for reciprocating said plunger to project the same beyond the end of said punch facing the other of said punches, and means reciprocable with said one punch and engageable with a stationary member, as said two punches approach maximum proximity, to actuate said plunger-reciprocating means to project said plunger into the other of said punches.

THOMAS H. HEATH.