A fixture for drilling sheets of fragile material is connectable to a movable machining head having a supporting structure and a rotary member, and includes a supporting frame, a shank for connecting the supporting frame to the supporting structure, and a first and at least a second powered spindle for a first and, respectively, a second drilling tool and extending in opposite directions with respect to the supporting frame; the spindles being rotated about respective axes parallel to each other by a transmission, an input member of which is connected to the rotary member of the machining head.
FIXTURE FOR DRILLING SHEETS OF FRAGILE MATERIAL, IN PARTICULAR, SHEETS OF GLASS

[0001] The present invention relates to a fixture for drilling sheets of fragile material, in particular, sheets of glass.

BACKGROUND OF THE INVENTION

[0002] Sheets of glass, to which the following description refers purely by way of a non-limiting example, are drilled on machines comprising a spindle fitted with a drill bit, which is pushed against and fed through the sheet to form dead or through holes. When drilling through holes, the bit, as it comes out on the opposite side, normally splinters the sheet, so that one of the edges of the through hole is discontinuous and normally "jagged". As a result, the drilled sheet cannot be tempered, as required in certain applications, such as glass doors, in that the sheet would shatter immediately on insertion inside the furnace.

[0003] To overcome the above drawback, sheets for tempering are drilled using special drilling machines comprising a number of rotary spindles, each fitted with a drill bit, and which rotate and move independently of one another. To drill each hole, a dead hole is first drilled by a first bit advanced a given distance depending on, and normally equal to less than half, the sheet thickness; the first bit is then withdrawn; and a second bit is advanced from the opposite side of the sheet until it breaks through the dead hole to form the through hole.

[0004] Though preventing splintering of the sheet around the through hole, the above drilling method calls for two drilling heads, and, above all, for a drilling machine with independent heads, which is used solely for drilling and is not always available in conventional sheetworking stations.

SUMMARY OF THE INVENTION

[0005] It is an object of the present invention to provide a fixture designed to provide a straightforward, low-cost solution to the above problem, and which, in particular, provides for splinter-free drilling using conventional sheetworking machines with a movable machining head.

[0006] According to the present invention, there is provided a fixture for drilling sheets of fragile material, in particular sheets of glass, and which is connectable to a movable machining head comprising a supporting structure and a powered rotary member; the fixture being characterized by comprising a supporting frame; connecting means for connecting the supporting frame to the supporting structure of the machining head; a first and at least a second spindle for a first and a second drilling tool respectively, said spindles being connected to said supporting frame to rotate about respective axes parallel to each other, and being oriented in opposite directions with respect to the supporting frame, so that the cutting edges of the tools are located on opposite sides of the supporting frame; and motion transmission means comprising an input member connectable to said rotary member, and which transmit motion to both said first and said second spindle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] A number of non-limiting embodiments of the invention will be described by way of example with reference to the accompanying drawings, in which:

[0008] FIG. 1 shows a schematic side view of a preferred embodiment of the fixture according to the present invention fitted to a movable machining head;

[0009] FIG. 2 is similar to, and shows a variation of a detail in, FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Number 1 in FIG. 1 indicates as a whole a movable machining head of a machine (not shown) for machining a sheet 2 of fragile material, such as glass, stone, marble, granite, etc. Machining head 1, which is known, comprises a supporting structure 3, and a powered rotary member 4 rotating inside structure 3 about an axis 5.

[0011] Machining head 1 is fitted releasably with a drilling fixture 7 for drilling both dead and through holes in sheet 2. With reference to FIG. 1, fixture 7 comprises a hollow supporting frame 10 elongated in a longitudinal direction 11 perpendicular to axis 5, and a known connecting portion or shank 12, not described in detail, for connecting hollow frame 10 to structure 3 of machining head 1. Frame 10 is bounded by two opposite lateral surfaces 13 and 14, and comprises two opposite longitudinal end portions 15 and 16, to which are connected, in known manner not described in detail, respective spindles 18 and 19 rotating about respective axes 20 parallel to axis 5 and perpendicular to longitudinal direction 11. Spindles 18 and 19 extend through respective surfaces 14 and 13, and support respective drilling tools 18a and 19a extending in opposite directions, so that their cutting portions 18b, 19b are located on opposite sides of frame 10. Spindles 18 and 19 are operated by a mechanical, preferably gear, transmission 22 (shown schematically), which extends entirely inside frame 10, and comprises an input shaft 23 extending through connecting shank 12 and connected in known manner to rotary member 4 of machining head 1 to transmit motion to both spindles 18, 19.

[0012] In the FIG. 1 example, end portions 15 and 16 of frame 10 are connected integrally to each other, so that the distance D between the axes of spindles 18 and 19, and therefore between the drilling tools, is predetermined and nonadjustable.

[0013] In the FIG. 2 example, end portions 15 and 16 are connected to each other by a known adjusting device 25 for adjusting the distance D between the axes of spindles 18 and 19, and therefore of the drilling tools. In a preferred embodiment, adjusting device 25 comprises a guide-slide coupling 26, and is a discrete adjusting device. Alternatively, adjusting device 25 is a continuous type, and is conveniently powered to permit any relative arrangement of spindles 18 and 19. In the example shown, transmission 22 also comprises a known, conveniently telescopic, adjustable transmission assembly 28 interposed between spindles 18 and 19.

[0014] In actual use, machining head 1 fitted with fixture 7 in FIG. 1 and 2 is first moved parallel to work sheet 2 to position one of the two drilling tools, e.g., tool 19a, as required, and then moves frame 10 towards sheet 2 in a direction parallel to axis 20 and by a given distance normally less than the thickness of sheet 2 to form a dead hole 29 (FIG. 2). Once the dead hole is drilled, and still moving machining head 1, tool 19a is backed up and away from sheet 2, and tool 18a...
is first positioned perfectly coaxial with the axis of hole 29, and is then advanced to form a through hole 30.

[0015] By employing a frame 10 supporting two tools 18a and 19a extending in parallel but opposite directions, fixture 7 described therefore provides for drilling through holes without splintering the sheet, and, above all, using an ordinary machine, which has a machining head with rotary member fitted selectively with different tools, each for performing a specific operation, e.g. grinding, etching, polishing, etc.

[0016] Clearly, changes may be made to fixture 7 as described herein without, however, departing from the scope of the present invention. In particular, frame 10 and/or shank 12 for connection to movable machining head 1 may be formed, otherwise than as shown by way of example, and spindles 18 and 19 may be connected to frame 10 in positions other than those shown, and may differ in number from that indicated by way of example.

1) A fixture (7) for drilling sheets (2) of fragile material, in particular sheets of glass, and which is connectable to a movable machining head (1) comprising a supporting structure (3) and a powered rotary member (4); the fixture (7) being characterized by comprising a supporting frame (10); connecting means (12) for connecting the supporting frame (10) to the supporting structure (3) of the machining head (1); a first (18) and at least a second (19) spindle for a first (18a) and a second (19a) drilling tool respectively, said spindles (18)(19) being connected to said supporting frame (10) to rotate about respective axes (20) parallel to each other, and being oriented in opposite directions with respect to the supporting frame (10), so that the cutting edges of the tools (18a)(19a) are located on opposite sides of the supporting frame (10); and motion transmission means (22) comprising an input member (23) connectable to said rotary member (4), and which transmit motion to both said first (18) and said second (19) spindle.

2) A fixture as claimed in claim 1, characterized in that the axes (20) of rotation of said spindles (18)(19) are spaced transversely apart.

3) A fixture as claimed in claim 1, characterized in that the axes (20) of rotation of said spindles (18)(19) extend parallel to the axis (5) of rotation of said rotary member (4).

4) A fixture as claimed in claim 3, characterized in that the axis (20) of rotation of one (18) of said spindles (18)(19) coincides with the axis (5) of rotation of said rotary member (4).

5) A fixture as claimed in claim 1, characterized in that said first (18) and said second (19) spindle are located a fixed distance (D) apart.

6) A fixture as claimed in claim 1, characterized by comprising adjusting means (25) for adjusting the distance (D) between said two spindles (18)(19).

7) A fixture as claimed in claim 6, characterized in that said adjusting means (25) are discrete adjusting means.

8) A fixture as claimed in claim 6, characterized in that said adjusting means (25) are continuous adjusting means.

9) A fixture as claimed in claim 6, characterized in that said supporting frame (10) comprises a first (15) and a second (16) end portion, each fitted with a respective said spindle (18)(19); said adjusting means (25) comprising at least a guide-slide coupling interposed between said end portions (15)(16).

10) A fixture as claimed in claim 1, characterized in that said supporting frame (10) comprises a cavity housing at least said transmission means (22).