July 9, 1968 W. J. MOORE 3,391,460

HOLE CUTTING APPARATUS

Filed Nov. 28, 1966 2 Sheets-Sheet 1

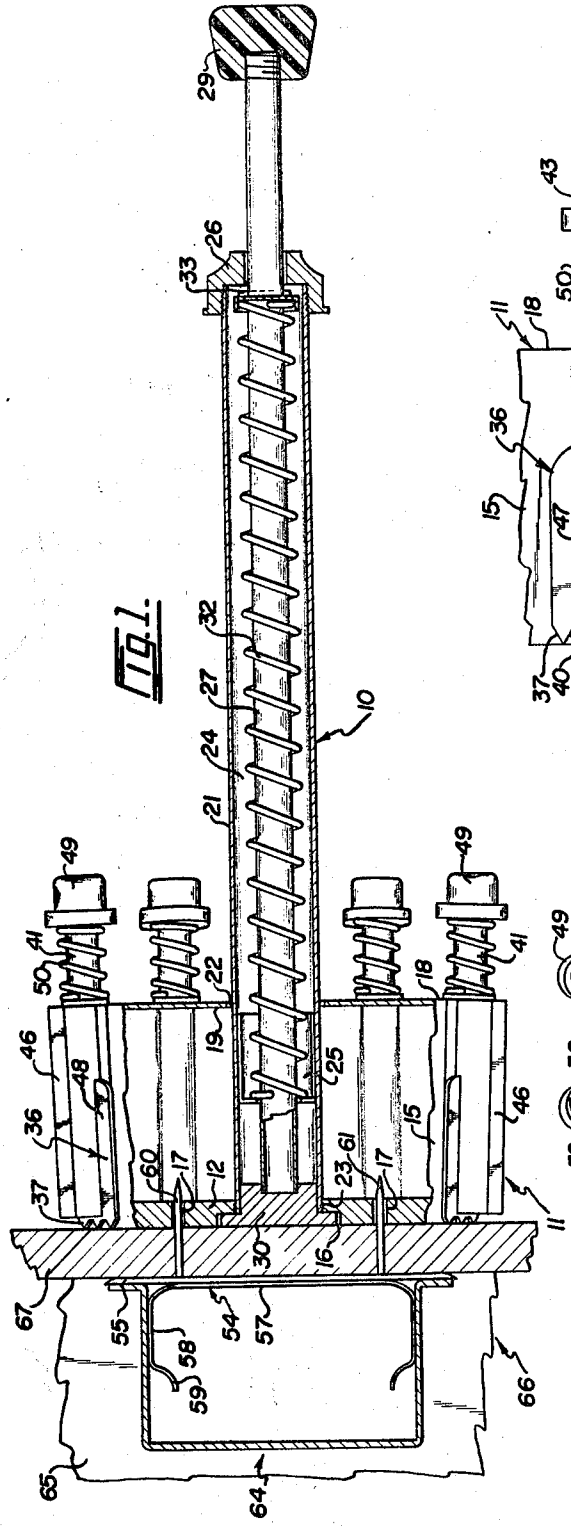


FIG. 1.

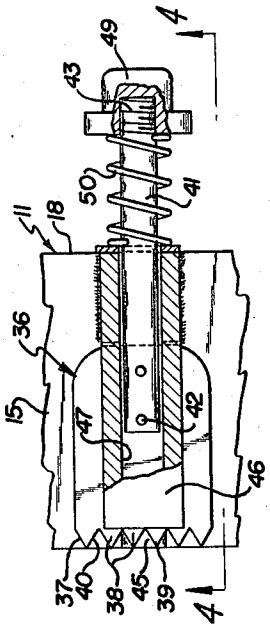


FIG. 3.

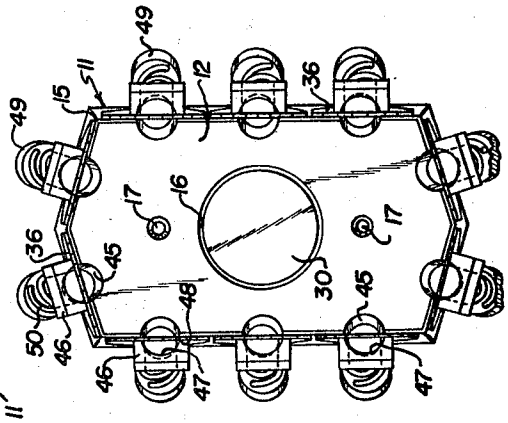


FIG. 2.

INVENTOR
WILLIAM J. MOORE
BY
Fetherstonhaugh & Co.
ATTORNEYS

July 9, 1968 W. J. MOORE 3,391,460

HOLE CUTTING APPARATUS

Filed Nov. 28, 1966 2 Sheets-Sheet 2

Fig. 4

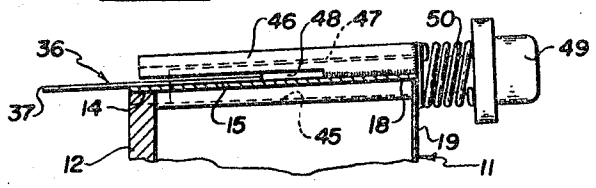
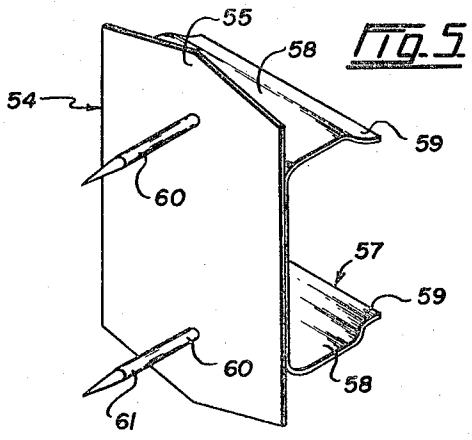


Fig. 5



INVENTOR
WILLIAM J. MOORE
BY
Fetherstonhaugh & Co.
ATTORNEYS

United States Patent Office 3,391,460 Patented July 9, 1968

3,391,460

HOLE CUTTING APPARATUS

William J. Moore, 3215 Wayne Drive, North Vancouver, British Columbia, Canada

Filed Nov. 28, 1966, Ser. No. 597,380
17 Claims. (Cl. 30—358)

ABSTRACT OF THE DISCLOSURE

An apparatus having a head on which a number of knives are mounted for individual operation to cut a section from a panel. A marker located on one side of the panel at the site selected for removal of the section and locating pins on the marker to project through the panel and serve as a guide for positioning the head on the other side of the panel. A handle on the head supporting a plunger which serves to eject a cut-out section from between the knife blades.

Background of the invention

This invention relates to apparatus which is particularly intended for use in marking the location of an outlet box covered by wallboard and for cutting and removing a section of the wallboard to provide an access opening to said outlet box, and which can be used for other purposes as well.

When interior walls or partitions are constructed, the usual procedure is to erect a supporting frame and subsequently to install conduits and outlet boxes on this frame. The boxes and conduits are then wired to provide the required electrical circuits with the ends of the wires terminating at the outlet boxes. The frame is later closed in using composition wallboard. Some tradesmen prefer to cut access openings in the wallboard prior to nailing the panels to the frame. Other tradesmen prefer to erect the board first and cut the holes later, using a hammer and chisel or keyhole saw. In either case, the location of the outlet boxes on the frame must be carefully measured and the measurements transferred to the boards. This task of marking the location of the boxes is time consuming and can lead to errors which might seriously damage the wallboard. In addition, when the openings are cut the side edges of said openings are often ragged and the surrounding surface of the board can be marred sufficiently to detract from the finished appearance of the wall.

It has previously been suggested that wallboard be cut after erection using a chisel-like tool somewhat like a baker's cookie cutter. This specialized tool has not proven too successful, due in part to the composition of present day wallboard. One particular wallboard in common use has an asbestos core and surface plies of paper. If a cutter of the aforementioned type is used to cut such board, the paper can be stretched as it is forced into the soft core material. The asbestos fibres of the core tend to resist cutting and become compacted so that considerable force is needed to drive the tool through the wall. And finally, the cut-out section often becomes wedged either in the wall opening or in the tool and must be pried therefrom before another cut can be made.

Summary of the invention

The hole cutting apparatus comprises a cutting tool having a head shaped to conform to the outline of the hole to be cut in a panel or the like. A plurality of knife blades are mounted on the periphery of the head for reciprocatory movement parallel to said periphery and to be projected beyond the panel contacting face of said head. Striker pins are provided on the independently operable knife blades so that said blades can be tapped into the

panel by a series of light blows applied to the striker pins. Thus, a section is cut from the panel by numerous small incisions which require little effort to make and which do not damage the panel as would be the case if a single large incision was made. The knife blades are positioned to grip the panel section cut away to form the hole and the cutting tool includes means for ejecting the section upon removal of the tool from the panel. A marker is used in conjunction with the cutting tool to facilitate the task of locating the exact site of the hole to be cut in the panel.

Brief description of the drawings

Hole cutting apparatus according to the present invention is illustrated, by way of example, in the accompanying drawings, in which:

FIGURE 1 is a longitudinal section of the apparatus in position of use, with parts being shown in elevation,

FIGURE 2 is an end elevation of the cutting tool,

FIGURE 3 is a fragmentary detail plan view, part in section showing a knife blade in retracted position,

FIGURE 4 is a section taken on the line 4—4 of FIGURE 3 and showing the knife blade in fully extended position, and

FIGURE 5 is a perspective view of the marker.

Description of the preferred embodiment

Referring to the drawings, the numeral **10** indicates generally a cutting tool having a main body portion or head **11**. The head **11** includes a base plate **12**, and extending outwardly from the marginal edge **14** of said plate is a relatively thin peripheral wall **15**. As shown best in FIGURE 2, both the edge **14** and the wall **15** of the present tool are polygonal viz. they have parallel sides and reverse bevelled ends. This particular shape corresponds roughly to the shape of the front face of a standard rectangular outlet box to which the present tool is related. It will be understood, however, that the base plate **12** and side wall **15** could be of another shape, for example, octagonal as would be required for another commonly used outlet box or they can be shaped to suit some other similar purpose. The plate **12** has a central aperture **16** and also two alignment holes **17** which are equidistantly spaced from said aperture along the centre of the base plate.

The wall **15** of the head **11** tapers outwardly from the edge **14** to the outer edge **18** of said wall, the taper being about 2° or so. Secured to the edge **18** is an outer wall **19** which is disposed parallel to the base plate **12**. A tubular handle **21** projects through a central hole **22** in the wall **19** and the inner end of this tube is secured as at **23** in the base plate **12**. The bore **24** of the handle **21** then communicates directly with the aperture **16**.

Near the outer wall **19**, the handle **21** is fitted in bore **24** with a retainer cup **25**. A collar **26** is threadedly secured to the outer end of the tubular handle and slidably mounted in this collar and the cup **25** is a plunger **27**. A knurled knob **29**, preferably of plastic, is threaded to the outer end of the plunger **27**. Fitted to the inner end of the plunger is an ejector foot **30** which normally is housed within the aperture **16** and the inner end of the bore **24**. A spring **32** encloses the plunger **27** between the cup **25** and a pin **33** which is secured to said plunger near the outer end thereof. The compression spring **32** serves to keep the plunger in the retracted position shown in FIGURE 1 with the inner face of the foot **30** flush with the corresponding face of the base plate **12**.

Referring now particularly to FIGURES 3 and 4, the numeral **36** indicates one of a number of knife blades which are mounted on the head **11**. The blades **36** are formed of thin sheet material and are provided with inner cutting edges **37** which may be knife edges or, as preferred, said edges have teeth **38** formed thereon. The teeth **38** are

triangular and have widely spaced tips 39 and suitably sharpened side edges 40. A cylindrical striker pin 41 is secured to each blade 36 as at 42 and the outer end 43 of said pin is threaded.

Spaced around the peripheral wall 15 of the head 11 are a number of longitudinally extending grooves 45, see FIGURE 2, which grooves extend into the marginal edge 14 of the base plate. Housings 46 are secured to the wall 15 above the groove 45 and these housings have grooves 47 which, like the grooves 45, are semi-circular in cross section. The opposing grooves 45 and 47 form bearings in which the striker pins 41 are slidably mounted. Slots 48 are provided between the housings 46 and the wall 15 of the head and, when fully retracted, the knife blades 36 fit into these slots. The threaded ends 43 of the striker pins are fitted with caps 49 and springs 50 are interposed between said caps and the outer ends of the housings 46. These compression springs bias the striker pins and their associated blades towards the fully retracted position. In this position, the cutting edges 37 of the knife blades are in register with the marginal edge 14 of the base plate and thus are not exposed where they might injure the apparatus user.

The above described cutting tool 10 is intended to be used in conjunction with a marker which is generally indicated by the numeral 54. As shown in detail in FIGURE 5, the marker 54 consists of a plate 55 which has the same polygonal shape as the base plate 12 of the head 11. However, the plate 55 is made slightly smaller than the plate 12. Secured to the inner face of the plate 55 to a broad leaf spring 57 which is shaped to provide a pair of clips 58. The spring clips 58 project inwardly from the plate 55 in suitably spaced relation and the free ends 59 of these clips are curved towards one another. Projecting outwardly from the plate 55 are two locating pins 60 having sharpened tips 61. The spacing between the pins 60 corresponds to the spacing between the alignment holes 17 in the base plate 12.

Referring again to FIGURE 1, the numeral 64 designates an outlet box of the type commonly used on interior walls and partitions. Normally these boxes are secured to the vertical support members or studs 65 of a wall frame 66 with their open sides facing outwardly of said frame as shown. Wallboard 67 in the form of panels of a standard size are adapted to be nailed over the frame 66.

Prior to nailing the wallboard panels to the frame, each outlet box is fitted with a marker 54. The spring clips 58 are thrust between the opposing end walls of the box and are thereby forced together slightly so as to frictionally grip said walls. The wallboard panel is placed in position and is thrust inwardly to drive the locating pins 60 of marker 54 through the panel. The tips 61 of the pins project a short distance beyond the outer face of the board and clearly mark the location of the outlet box 64.

The cutting tool 10 is supported horizontally and placed against the wall so that the locating pins 60 are entered into the alignment holes 17. A hammer is used to drive each knife blade 36 in turn into the wallboard. This is best done by striking the caps 49 on the pins 41 a series of light blows to tap the blades through the boards. Preferably, the knifes are driven home in proper sequence working around the base plate 11 until a section or plug is cut from the board. It will be found that the wallboard section is lodged between the blades and that said blades are held in fully extended position by the section. Since the blades 36 converge inwardly, the side edges of the cut-out section are tapered and it is then a simple matter to withdraw the section from the board. After this is done, by striking the knob 29 a light blow, the ejector foot 30 is moved away from the head 11 to dislodge the section from between the blades.

It will be noted the base plate 12 is slightly larger than the marker plate 55. Thus, the access opening cut by the blades is large enough to permit the marker 54 to be removed from the box 64. Since the blades 36 have only limited inward movement they cannot be driven far enough to strike and damage the box or dull the cutting edge 37 of the knife blades.

Because of the triangular shape of the teeth 38 on the knife blades, the board is cut without tearing the paper or compacting the core. This is largely due to the fact that tips 39 initially puncture the paper and subsequently the paper and the core fibres are severed by the angularly disposed edges 40 with a slicing action. Also the cut is progressively made around the head of the tool so that there is less likelihood of the wallboard being distorted in the vicinity of the box.

The apparatus has been described as adapted to cut multi-sided holes but it will be appreciated that a similar tool could be constructed to cut holes of a variety of shapes. For example, the head of the cutting tool could be modified to cut round holes. The peripheral wall then would be circular as well as slightly tapered and the knife blades would be curved to conform to the curvature of said wall. Such a device could be used in the described manner to cut a round and inwardly tapering plug from a wallboard panel or the like.

What I claim as my invention is:

1. Hole cutting apparatus comprising a base plate having an inner face and a marginal edge, a plurality of knife blades having inner cutting edges and outwardly projecting striker pins, said knife blades being disposed parallel to the marginal edge and in side-edge to side-edge relation to form a substantially continuous blade extending around the base plate, mounting means on the base plate for the knife blades, said mounting means supporting the knife blades for reciprocatory movement whereby said knife blades are individually operable to project their cutting edges a predetermined distance inwardly of the inner face of the base plate.

2. Hole cutting apparatus as claimed in claim 1, including a spring urging each knife blade outwardly to dispose its cutting edge in close proximity to the marginal edge of the base plate.

3. Hole cutting apparatus as claimed in claim 2 in which said mounting means supports the knife blades so as to converge inwardly.

4. Hole cutting apparatus as claimed in claim 3, including triangular teeth on the cutting edges of the knife blades, said teeth having widely spaced tips and sharpened side edges.

5. Hole cutting apparatus as claimed in claim 3, in which said base plate has a central aperture, and including an outwardly extending handle secured to the base plate and having a bore communicating with the central aperture, a plunger mounted in the bore and having an inner end and an outer end, said inner end normally being housed within the central opening and said outer end projecting from the bore of the handle.

6. Hole cutting apparatus as claimed in claim 5, including a spring urging the plunger outwardly of the handle.

7. Hole cutting apparatus as claimed in claim 6, including an ejector foot secured to the inner end and a knob secured to the outer end of the plunger.

8. Hole cutting apparatus as claimed in claim 1, wherein the mounting means includes a peripheral wall tapering outwardly from the marginal edge of the base plate, said peripheral wall and marginal edge having grooves to receive the striker pins, grooved housings secured to the peripheral wall above the grooves therein to slidably enclose portions of the striker pins, said striker pins projecting outwardly of the housings and being fitted with enlarged heads, compression springs along the striker pins between the housings and the enlarged head, said housings having slots into which the knife blades normally are urged by the springs.

9. Hole cutting apparatus for removing a section of wallboard to provide an access opening to an outlet box, the combination of a cutting tool having a base plate,

said base plate having an alignment hole therein, an inner face and a marginal edge, a plurality of knife blades having inner cutting edges and outwardly projecting striker pins, said knife blades being disposed in side-edge to side-edge relation to form a substantially continuous blade extending around the base plate, mounting means on the base plate for the knife blades, said mounting means supporting the knife blades for reciprocatory movement whereby said knife blades are individually operable to project their cutting edges a predetermined distance inwardly of the inner face of the base plate, and a marker plate adapted to be removably attached to the outlet box prior to application of the wallboard, said marker plate having a locating pin projecting outwardly therefrom and adapted to extend through the wallboard, said locating pin being received in the alignment hole of the base plate to position the cutting tool over the outlet box.

10. Hole cutting apparatus as claimed in claim **9**, including inwardly projecting spring clips on the marker plate adapted to frictionally engage the outlet box to retain said plate thereon.

11. Hole cutting apparatus comprising a base of a predetermined shape, a plurality of individual knife blades having cutting edges, each knife blade being slidably mounted on said base and arranged around the latter in edge to edge relationship to form a substantially continuous cutting edge around the base and facing outwardly therefrom, handle means connected to the base by means of which the base can be placed against a sheet in which a hole is to be cut with said continuous cutting edge facing said sheet, and means connected to each blade against which blows may be struck to individually press each blade along the base into said sheet.

12. Hole cutting apparatus as claimed in claim **11**, in which said blades are slightly inclined inwardly relative to the base and in the direction of the cutting edges thereof.

13. Hole cutting apparatus as claimed in claim **11**, including spring means for each blade normally retaining said blade in a retracted position with its cutting edge against the base.

14. Hole cutting apparatus as claimed in claim **11**, in which the base includes at least one alignment hole therein within the area bounded by said continuous cutting edge.

15. Hole cutting apparatus as claimed in claim **11**, including a plunger mounted on the base and having an end movable outwardly from said base within the area bounded by said continuous cutting edge.

16. Hole cutting apparatus as claimed in claim **11**, including triangular teeth on and projecting outwardly from the cutting edge of each blade, said teeth having widely spaced tips and sharpened side edges.

17. Hole cutting apparatus comprising a base of a predetermined shape, a plurality of individual knife blades having cutting edges, each knife blade being slidably mounted on said base and arranged around the latter in edge to edge relationship to form a substantially continuous cutting edge around the base and facing outwardly therefrom, said base having at least one alignment hole therein within the area bounded by said continuous cutting edge, handle means connected to the base by means of which the base can be placed against a sheet in which a hole is to be cut with said continuous cutting edge facing said sheet, means connected to each blade against which blows may be struck to individually press each blade along the base into said sheet, and a marker plate having at least one locating pin projecting outwardly from said plate adapted to be received in an alignment hole of said base to position the base relative to the plate.

References Cited

UNITED STATES PATENTS

3,251,130	5/1966	Miles	30—358
2,830,662	4/1958	Marcum	30—358
2,787,324	4/1957	Hartmeister	30—360
3,095,021	6/1963	Schlage et al.	145—25

WILLIAM W. DYER, JR., *Primary Examiner.*

G. WEIDENFELD, *Assistant Examiner.*