Sept. 24, 1968 F. H. OTIS 3,402,869

PORTABLE C-CLAMP PRESS

Original Filed Oct. 12, 1965 3 Sheets-Sheet 1

FIG. 1

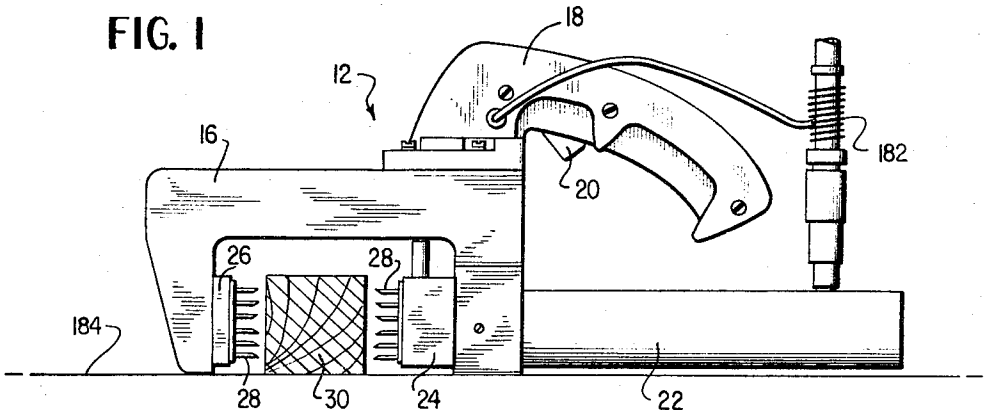


FIG. 2

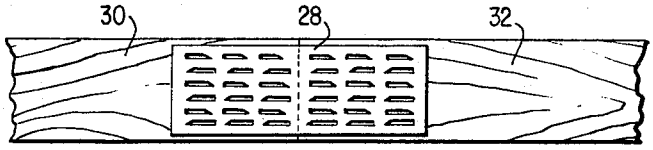
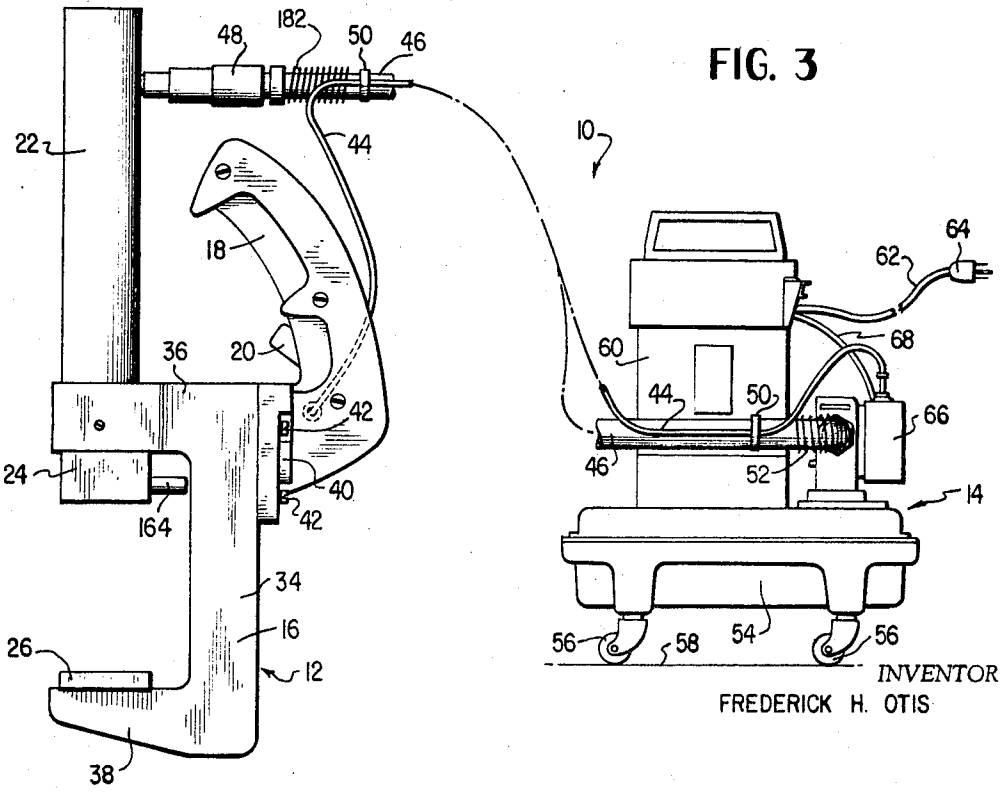


FIG. 3



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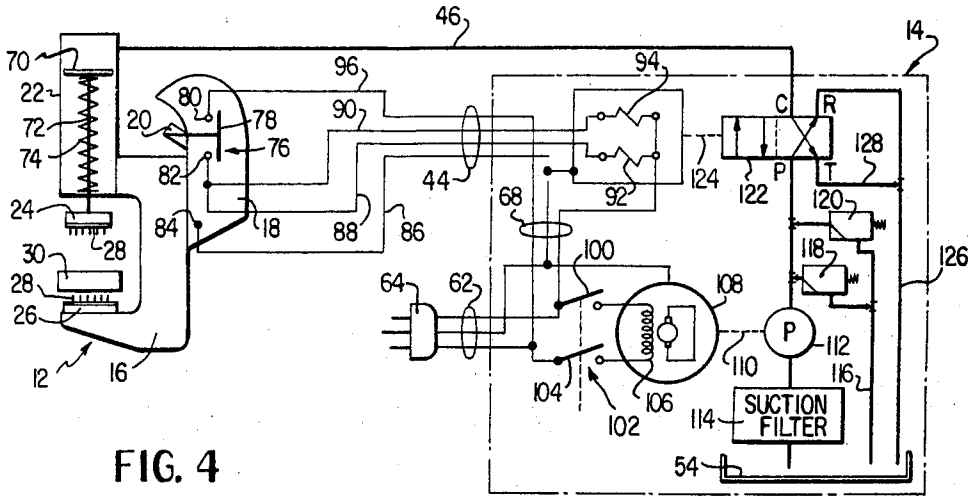


FIG. 4

FIG. 5

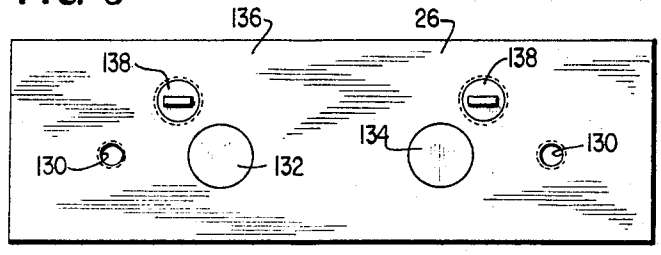


FIG. 6

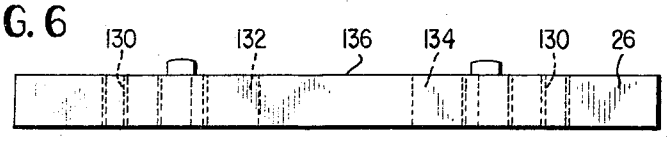
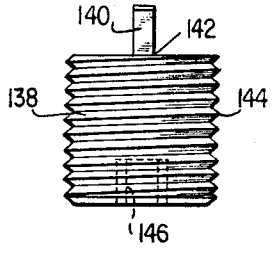


FIG. 7



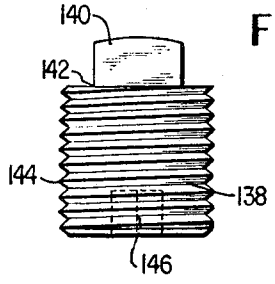


FIG. 8

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FIG. 9

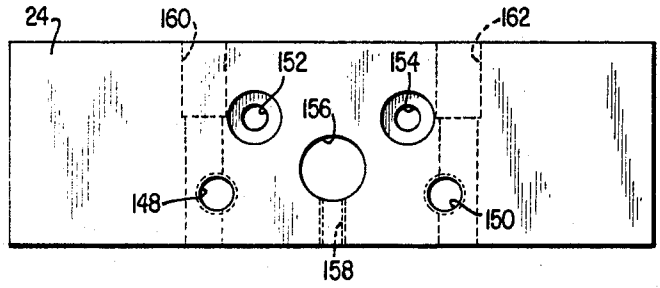


FIG. 10

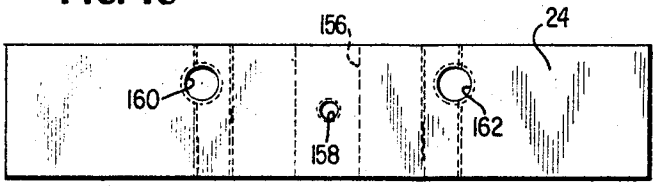


FIG. 14

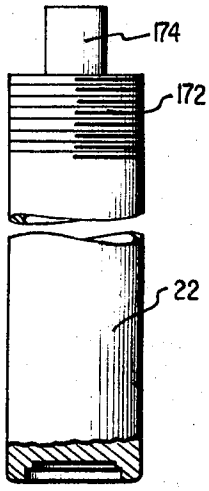
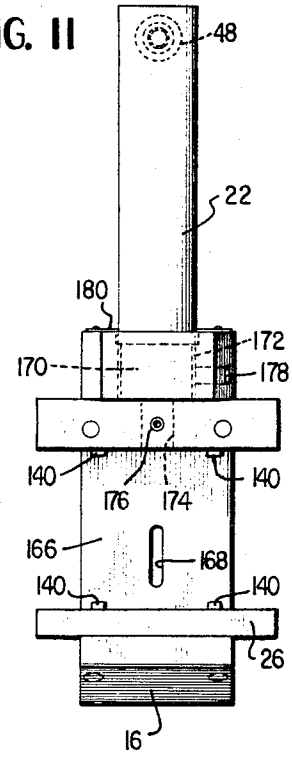


FIG. 11



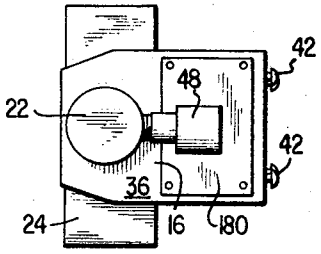


FIG. 13

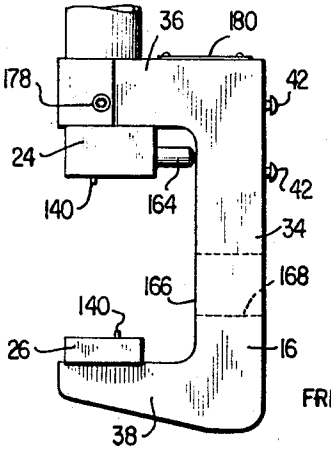


FIG. 12

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3,402,869

PORTABLE C-CLAMP PRESS

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Continuation of application Ser. No. 495,166, Oct. 12, 1965. This application Aug. 7, 1967, Ser. No. 658,948
3 Claims. (Cl. 227—152)

ABSTRACT OF THE DISCLOSURE

Disclosed is a portable C-clamp press for driving metal connectors into structural lumber and particularly the lightweight wood structures used in mobile homes. The press frame and platens are made of aluminum to form a hand unit weighing no more than 10½ pounds but having a nominal rated capacity of 3 tons of squeezing pressure. The hydraulic cylinder driving the movable platen is coupled by a flexible line to a caster mounted power unit and controlled by an electrical switch on the hand unit.

The present application is a continuation of application Ser. No. 495,166, filed Oct. 12, 1965, and now abandoned.

The present invention relates to a light weight portable C-clamp type press for driving connectors into structural lumber elements and is particularly adapted for use in conjunction with the fabrication of light weight wood structures, such as those used in all phases of mobile home construction.

In assignee's U.S. Patent No. 3,207,406, there is disclosed a very satisfactory C-clamp type center closing press for driving or pressing metal connector plates into structural lumber. The press of that patent is particularly suitable for forming roof trusses, wherein the wood elements are relatively heavy or it is otherwise difficult to bring the elements to be joined into contact with one jaw of the press.

The present invention relates to a C-clamp type press of the same general construction, but one that is extremely light weight and portable so as to be readily adapted for use by manufacturers using lighter dimensioned lumber, particularly those engaged in the fabrication of mobile homes. The instant press is designed for use with relatively small size metal connector plates, generally on the order of a 1½" by 3⅜", 20 gauge plate (U.S. standard gauge). It makes the use of these metal connector plates in all phases of mobile home construction much more practical than heretofore and makes more readily possible the use of these plates by smaller manufacturers and builders of travel trailers and campers, whose production may be of such a nature as to not warrant the use of the larger press of the aforementioned copending application.

In the unit herein disclosed, spaced fixed and movable jaws are mounted on a light weight aluminum C-shaped frame. The movable platen or jaw is hydraulically actuated by a more or less conventional single acting spring returned hydraulic piston and cylinder, supplied with a suitable light weight hydraulic oil from a pump developing sufficient pressure so as to provide a 3-ton capacity or 6,000 pound squeezing force for driving the connectors into the wood. The pump is contained in a power unit provided with casters and a handle for easy mobility and is connected to the hand unit by a 40 foot hydraulic hose and electrical control cord. Pressing times, i.e., the time necessary to drive the connector plates into the wood, are in the neighborhood of two seconds making possible the ready fabrication of many types of lumber assemblies and the extension of short lumber usage, i.e., turning into useful lumber wood materials that would otherwise be classified as "scraps."

The unit is designed to form strong, economical spliced lumber joints and operates from regular power tool electrical circuits. Also provided is a convenient on-off motor switch actuated power unit mounted on wheels for easy mobility and coupled to a hand unit incorporating a gun type trigger switch which is squeezed to press the connector plate and released to open the press. Locating pins and magnetic inserts hold the metal connector plates in the press unit prior to their insertion into the wood. Finally, the high strength aluminum construction of the hand unit provides light weight, long life and dependable service with a high work capability and at low cost. Designed for use in mobile home constructions, the press of this invention may be used in all types of high speed production such as for splicing floor stringers, wall stringers, belt bands, bow-string trusses, half-trusses and other types of special requirements.

It is therefore one object of the present invention to provide a novel fluid powered press.

Another object of the present invention is to provide an electrically controlled, hydraulically operated C-clamp press for driving connector plates into structural wood joints.

Another object of the present invention is to provide a light weight portable hydraulic press particularly adapted for use in the formation of light weight wood structural units.

Another object of the present invention is to provide a hydraulically powered C-clamp press adapted for use in mobile home construction.

Another object of the present invention is to provide an electrically controlled, hydraulically powered press of light weight portable construction having increased flexibility for use in making all types of joints and one which may be operated from a conventional 110-volt AC power tool outlet. In this unit a hydraulic cylinder and enclosed piston is threaded into the bottom of a generally C-shaped frame forming a principal element of the hand unit. Operation of the unit is electrically controlled by means of a trigger switch conveniently mounted on a gun-type handle also secured to the C-shaped frame. Stationary and movable platens are mounted to the frame, both preferably provided with connector plate aligning and holding means in the form of aligning pins and permanent magnet inserts. Upon operation of the trigger, the movable platen carried by the rod of the piston in the hydraulic cylinder is moved toward the stationary platen of the press to drive a pair of connector plates into the opposite sides of a pair of wood members to be joined to form a rigid, stress-bearing butt or spliced joint. When the trigger is released, a return spring in the hydraulic cylinder returns the movable platen to its open or rest position so that the press is ready for the next operation. Closing forces of as much as 6,000 pounds between the platen surfaces, and more, are developed by the light weight, inexpensive hand unit, making it possible to drive a variety of metal connector plates into various types of structural lumber. The roller-mounted power unit and the forty-foot hydraulic hose and electrical power cord make it possible to move the completely portable unit wherever desired, so that the unit finds wide application at all stages of assembly and at all locations in the manufacturer's plant and yard.

These and further objects and advantages of the invention will be more apparent upon reference to the following specification, claims and appended drawings wherein:

FIGURE 1 is a side elevation showing the hand unit of the present invention operating to form a butt joint

by driving a pair of metal connector plates into opposite sides of a pair of wood elements to be joined;

FIGURE 2 is a view of the finished joint after the press has been used to drive the connector plates into the wood;

FIGURE 3 is an elevational view showing the overall press assembly of the present invention, including both the hand unit and the roller-mounted power unit;

FIGURE 4 is an electrical wiring diagram for the overall assembly of FIGURE 3;

FIGURE 5 is a plan view of the lower or stationary platen of the press of this invention;

FIGURE 6 is a side view of the stationary platen of FIGURE 5;

FIGURE 7 is an elevational view of one of the locating screws or aligning pins incorporated in the platen of FIGURES 5 and 6;

FIGURE 8 is a similar elevational view of the connector plate aligning pin taken at right angles to that of FIGURE 7;

FIGURE 9 is a plan view of the upper or movable platen of the press of this invention;

FIGURE 10 is an elevational view of the movable platen of FIGURE 9;

FIGURE 11 is a front elevation of the C-shaped frame and hydraulic cylinder portion of the hand unit of this invention;

FIGURE 12 is a partial side elevation showing the frame of FIGURE 11;

FIGURE 13 is a plan view showing the cylinder and frame assembly; and

FIGURE 14 is a view with parts in section showing the hydraulic cylinder incorporated in the hand unit of the press of this invention.

Referring to the drawings, the overall assembly of the present invention is generally indicated at **10** in FIGURE 3 and comprises a hand unit **12** and a caster-mounted power unit **14**. Referring to FIGURES 1 and 2, hand unit **12** comprises a C-shaped aluminum frame **16** to which is secured a gun-type handle **18** having an electrical switch actuator in the form of a trigger **20**. Attached to the frame **16** is a hydraulic cylinder **22** having internally mounted thereon a sliding piston and piston rod, this latter being rigidly connected at its end to a movable platen **24**. A stationary platen **26** is rigidly attached to the other arm of the frame. Each of the platens carries a connector plate **28** having a plurality of punched-out, elongated nail-like teeth adapted to be driven into the abutting wooden elements **30** and **32**. These connector plates are preferably formed from flat sheet metal mild steel stock, either galvanized or uncoated, and have a plurality of integral teeth punched out normal to one surface of the platen so as to form a rigid, stress-bearing butt or spliced joint between the wooden members. By way of example only, these plates may be formed of 18 U.S. standard gauge galvanized mild steel, as more fully shown and described in assignee's copending application Ser. No. 250,663, filed Jan. 10, 1963 (now abandoned). Other types and gauges of connector plates may, of course, be readily used in conjunction with the press of this invention.

Referring to FIGURE 3, the hand unit frame **16** comprises a central or intermediate straight portion **34** having at each end an integral arm **36** and **38**. Stationary platen **26** is mounted on arm **38** while movable platen **24** is mounted on a piston rod reciprocal in cylinder **22**, which rod passes through the other frame arm **36**. Handle or pistol grip **18** is provided with a flange **40** at its lower end secured to frame **16** by four screws, two of which are illustrated at **42** in FIGURE 3. The pistol grip receives one end of an electrical cord **44** which is preferably some forty feet in length and leads along with the flexible hydraulic tubing **46**, also of this length, back to the power unit **14**. Hydraulic cylinder **22** is threaded at one end into arm **36** of the frame **16** and adjacent its other end is provided with an aperture establishing fluid communication with a conventional quick connect and disconnect hydraulic hose coupling, generally indicated at **48**. Hose **46** adjacent the quick connect and disconnect coupler **48** is provided with a pair of spring guards **182** and **52** at least some of the windings of which overlie a portion of the electrical cord **44**. This arrangement acts to support and retain the end of the cord **44** adjacent the hand unit **12** against undue stress which might be exerted should the operator attempt to move the hand piece beyond the length of the hose and cord. Ties **50** hold hose **46** and cord **44** together, and for this purpose are preferably spaced every eighteen to twenty-four inches along the length of the hose and cord. Spring guards **182** and **52** also help to prevent chafing or sharp bending of the hydraulic hose where it is most susceptible to such damage at the end fittings. A similar spring guard is provided around the hose and cord adjacent the power unit, as illustrated at **52** in FIGURE 3.

Power unit **14** comprises an oil tank **54** mounted on four caster wheels, two of which are illustrated at **56**, so that the entire unit may be moved about over a flat surface such as that illustrated at **58**. Atop the tank **54** is a housing **60** containing an electrical motor, hydraulic pump and other associated eqeuipment. Electrical energy is supplied to the interior of housing **60** by way of a supply cord **62** terminating in a three-prong male plug **64**. Also mounted atop oil tank **54** is an electrical solenoid operated hydraulic valve assembly, generally indicated at **66**, coupled to the remainder of the circuitry by way of cord **68**.

FIGURE 4 is an electrical wiring diagram for the overall assembly illustrated in FIGURE 3. In this drawing, hydraulic cylinder **22** is illustrated as enclosing a slidable piston **70** to which is secured, in a conventional manner, a piston rod **72**. At its other end, piston rod **72** is rigidly secured to the upper movable platen **24**. A compression return spring **74** surrounds rod **72** bearing at one end on the piston and at the other end on the interior surface of the cylinder **22** through which piston rod **72** slides.

Handle **18** is provided with a trigger-actuated, normally closed switch **76** provided with a conventional return spring (not shown) by means of which the movable contact **78** of the switch is normally closed against the stationary contacts **80** and **82**. The conductive aluminum metal handle, and hence the entire frame and cylinder of the hand unit, is grounded by means of a grounding screw or contact **84** connected to ground wire **86**. Cord **44** is a four-wire cord and in addition to ground wire **86** includes wires **88** and **90** connecting switch terminal **82** to one side of the respective valve solenoids **92** and **94**. The final wire **96** in cord **44** connects the others with stationary contact **80** through three-wire conductive cord **68** to one terminal **104** of a double-pole, single-throw motor toggle switch **102**. This terminal of switch **102** is also connected through power supply cord **62** to one of the prongs of two-wire three-pole plug **64**. The central wire of cord **62** is a ground wire for grounding both the power unit and the hand unit while the third wire of cord **62** couples the source of power to the other movable contact **100** of switch **102**.

When switch **102** is manually closed, it connects the power supply to the coil **106** of an electrical motor **108** whose armature, as indicated by dashed lines at **110**, drives a hydraulic pump **112**. The fluid input to the hydraulic pump is from the oil tank **54** by way of a suction filter **114**. The output of the hydraulic pump is connected to a return line **116** for returning hydraulic oil to the oil tank **54** by way of an adjustable relief valve **118** and a factory sealed relief valve **120**. These valves are spring returned or spring biased closed, as illustrated in FIGURE 4.

The output of hydraulic pump **112** also supplies a three-way valve **122** electrically actuated by the valve solenoids **92** and **94**, as indicated by the dashed line

124. When valve 122 is energized, hydraulic pump port P is coupled through the valve to return port R coupled by way of return line 126 to oil tank 54. At the same time, cylinder port C is coupled through the energized valve to tank port T and in turn connected by line 128 to the oil tank return line 126. Cylinder port C is coupled to the flexible hose 46 leading to the rear side of piston 70 in cylinder 22.

The power supply plug 64 at the end of the cord may be plugged into an appropriate 110/120 volt single-phase 60-cycle AC receptacle. The third wire is a ground connection for the system as illustrated. When the plug is inserted into a power supply outlet, the two solenoids 92 and 94 of the control valve are immediately energized. However, in order to operate the unit it is now necessary to start the electric motor and pumping action by manually flipping the toggle switch 102 on the motor cover. A light hydraulic oil is then pumped from the enclosed reservoir or oil tank 54 through the filter 114 to the hydraulic double solenoid control valve 122. At this time oil is passing through the valve from port P to port R and back to the tank. The cylinder line valve port C is also open to the tank by way of port T and line 128. When the motor switch is turned on, the ½-horsepower repulsion electric motor 108 drives hydraulic pump 112 to deliver approximately 54 cubic inches of oil per minute through the P–R ports of the electric valve and the oil returns to the tank of the power package. Oil also can return through the C–T ports of the tank due to return spring pressure in the hydraulic cylinder 22. Both solenoids of the electric valve are energized for this valve porting. These solenoids are energized even before the motor switch is turned on, due to their direct connection to the power plug 64.

In order to actuate the press, the operator presses trigger 20 to open the normally closed switch 76 in the trigger handle 18. This switch is biased by a suitable spring (not shown) to the closed position so that the switch opens and remains open only as long as the operator maintains finger pressure on the trigger. When the trigger switch is open, the solenoids 92 and 94 of the electrical valve are de-energized and the oil flow is directed through the P–C ports of valve 122 to the hydraulic cylinder 22, pressing the upper platen 24 on the end of the piston rod toward the stationary lower platen 26 of the C-frame. The platens squeeze the metal connectors into the pieces of lumber, forming a rigid type of butt or spliced joint. At approximately 6,000 p.s.i. pressure, one of the oil relief valves—for example, adjustable valve 118—opens, diverting excessive oil flow from the pump 112 directly to the oil tank 54.

To retract upper platen 24, the trigger 20 is released by the operator. When the trigger switch contacts close, both solenoids are again energized, and the electric valve 122 directs the spring pressure returned oil flow from the cylinder 22 via ports C–T to the tank 54. Pump 112 at the same time delivers oil via the ports P–R to the oil tank. For long idling periods, the pump may be stopped by turning the motor switch 102 to the open or off position. When the device is not in use, power plug 64 should preferably be disengaged from the power supply, to avoid a possible overheating of the solenoids.

FIGURES 5 and 6 show the details of the lower fixed platen 26. This platen in one embodiment constructed in accordance with the present invention is 4¾ inches long, 1½ inches wide and ½ inch thick. It is made of hard, high-strength aluminum alloy to save weight, to provide a durable surface, and to resist any overhang bending moments. Platen 26 is provided with two ¼-inch diameter tapped holes 130 for mounting the platen to the C-frame 16. Press fit into suitable holes through the platen 26 are a pair of cylindrical magnets 132 and 134. These magnets are preferably ½ inch in diameter, ½ inch long, and provided with plastic jackets, i.e., they are enclosed in cups made of suitable plastic material. The 37/64-inch diameter through holes in the platen allow the magnets to be pressed into the holes surrounded by the plastic cups. The one end of each magnet which is not encased in plastic remains flush with the platen pressing surface 136. The protruding plastic at the other end can be removed flush.

Threaded into stationary platen 26 are a pair of set screws 138, one of which is shown in more detail in FIGURES 7 and 8. These screws are each provided with elongated, curved aligning pins 140 preferably formed integral with the body of the screw. These are formed by removing metal from the point of the set screw in the area indicated at 142 in FIGURES 7 and 8 by grinding or milling. The screws are provided with suitable threads 144 received in corresponding threaded apertures in platen 26 and are provided with a socket 146 adapted to receive a suitable tool for threading the screws into the platen. The aligning pins 140 are adapted to be received through slots in the connector plates 28 and are located so that either an 18- or 20-gauge sheet metal plate can be placed on them so that the plate will be properly centered on the platen. These pins also help to keep the plates from sliding on the platen while they are being pressed and while the C-shaped frame is being positioned for pressing, even if the connector plate is lightly rubbed while the press is being maneuvered to the center of the wood joint to be spliced.

FIGURES 9 and 10 show the details of the upper or movable platable 24. This plate in the previously described embodiment is 4¾ inches along x 1¾ inches wide x 1 inch thick. The material of the platen is hard, high-strength aluminum alloy. When the platen is in position in the frame, the front end aligns with the lower platen 26 while the inside surface of the upper platen overhangs the lower platen in order to provide material to compensate for the additional holes drilled in the upper platen. This upper platen is similarly provided with two ⅜-inch diameter tapped through holes 148 and 150 for receiving a pair of aligning-pin set screws in all respects similar to the set screws 138 illustrated in deail in FIGURES 7 and 8. Movable platen 24 is also provided with a pair of ¼-inch diameter holes 152 and 154. These holes are counterbored to 37/64-inch diameter, 9/16-inch deep, for receiving magnets and cups in all respects similar to those described in conjunction with the lower platen 26.

Additional apertures in the upper platen 24 include a central reamed hole 156 for receiving with a press fit the extreme end of the piston rod 72 of FIGURE 4. Communicating with this central hole or aperture is a ¼-inch tapped hole 158 adapted to receive a set screw for rigidly securing the platen to the piston rod. Finally, the upper platen 24 is provided with a pair of apertures 160 and 162 adapted to receive with a press fit a pair of guide dowels, one of which is illustrated at 164 in FIGURES 3 and 12. These ⅜-inch diameter aluminum alloy guide dowels are pressed into the back of the platen and the ends of the protruding dowels slide on the inside surface 166 of the C-frame when the hydraulic cylinder is actuated, so as to keep the platen and piston rod from rotating. It should be noted that although the piston rod can be kept from rotating by a pin and slot modification to the hydraulic cylinder, the guide dowels 164 serve double duty. That is, they keep the rod from tuning and also keep the platen 24 from turning on the rod. Otherwise, under repeated pressing loads, the set screw received through aperture 158 might permit the platen to turn on the end of the hydraulic cylinder piston rod.

The press hand unit including C-shaped frame 16 and hydraulic cylinder 22 is illustrated to an enlarged scale in FIGURES 11–13. The C-shaped frame 16 is cut from a bar of aluminum alloy and the central portion 34 of the frame is provided with an elongated ¼ inch x 1¼ inch slot 168 which acts as a sighting or peephole so that the operator can view the wood joint and the connector plates before and during the pressing of a joint. This peephole is a convenience and saves time in that the open area, the

so-called front of the press head, is normally away from the operator while the press is being used.

The upper arm **36** of the C-shaped frame is tapped, as indicated at **170**, to receive the threaded end **172** of the hydraulic cylinder, illustrated in detail in FIGURE 14. From the threaded end **172** of the cylinder **22** projects the end **174** of piston rod **72**, this end being press fit into reamed hole **156** in the platen **24**, as illustrated in dashed lines in FIGURE 11, and is retained by set screw **176** received in the tapped hole **158** of FIGURES 9 and 10. Cylinder **22** is additionally secured to the upper arm **36** of the frame by a similar tapped hole and set screw **178**. Finally, the frame is provided with a nameplate **180** and four attaching screws **42** by means of which the handle **18** is attached to the frame.

It is apparent from the above that the present invention provides a novel press assembly whose overall aluminum construction provides not only for a light weight hand unit but also substantial strength and rigidity, making it possible to develop squeezing pressures of 6,000 pounds on the pressing surface, and greater. The unit is completely portable, such that the light weight hand unit or hand piece may be held in one hand of the operator while the caster-mounted power unit may be readily moved to any desired location in the manufacturing or assembly plant. The unit is particularly designed for the prefabrication of supporting framework elements useful in the construction of mobile homes. The unit may be provided in various sizes and dimensions, so as to be adaptable to all types of light weight framing assemblies. While particularly adapted for use in conjunction with the 18-gauge plates described in assignee's copending application Ser. No. 250,663, filed Jan. 10, 1963, or the 20-gauge connector plate described in assignee's copending application Ser. No. 293,949, filed July 10, 1963, the novel press of the present invention may be used in conjunction with all types of connector plates or wherever a light weight portable press unit is desirable.

In the previously described embodiment, the overall weight of the hand unit is approximately 10½ pounds, while the total shipping weight of the entire assembly including the hand unit and power unit is approximately 110 pounds. The power unit is provided with a drive motor for the hydraulic pump having a horsepower rating of ½ horsepower, operating from a 115 or 230 volt conventional 60-cycle AC outlet and drawing 7 amps at 115 volts. The capacity of the hydraulic reservoir in this embodiment is approximately one gallon of light weight, high foam resistant hydraulic oil. The sealed relief valve is preferably factory set at 6,500 p.s.i. with an additional adjustable relief valve factory set in the neighborhood of 5,500 p.s.i. to give a nominal rated capacity in the neighborhood of 3 tons of squeezing pressure.

Additional important features of the present invention include the provision of alignment pins and permanent magnet inserts for accurately locating and holding metal connector plates prior to and during pressing. In this way, it is possible for the operator, through the use of the device of this invention, to bring the press to the location of the workpiece—which in many instances may be relatively heavy, cumbersome, or otherwise difficult to maneuver and manipulate during assembly—and convenient operation is assured through the gun handle and trigger switch actuator of the hand unit or hand piece, providing a total press operating time (with 1⅝ inch lumber) of approximately 2 seconds, and a rapid spring return of the hydraulic piston making the unit ready for the next operation. As can be seen in FIGURE 1, the distance from the platen centerline to the press outer face is such that wood can be spliced even when it is lying on a flat surface, such as the surface **184** in that figure.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A portable lightweight hydraulic press for driving metal connector plates into lumber comprising a hand unit including a generally C-shaped aluminum frame, a fixed aluminum platen secured to one arm of said frame, a hydraulic piston and cylinder secured to the other arm of said frame, a movable aluminum platen secured to said piston, a permanent magnet embedded in each of said platens, a return spring in said cylinder for returning said piston to a retracted position, a handle mounted on said frame and including an electrical switch, a remote power unit mounted on casters for movement in all directions over a flat floor-type surface, said power unit including a source of hydraulic fluid for said cylinder, a pump, an electric motor coupled to said pump, a sump, a solenoid actuated two-piston hydraulic fluid valve, a flexible hose coupling said valve to said hydraulic cylinder, a flexible electric cord coupling said solenoid actuated valve to said electrical switch, and means for energizing said motor, said valve in a normal first position coupling one end of said cylinder and the output of said pump to said sump, said valve being movable to a second position in position in response to actuation of said switch to couple said one end of said cylinder to the output of said pump to extend said piston against the bias of said spring, means for preventing rotation of said movable platen as it is extended, said hand unit having a total weight of not over 12 pounds.

2. A press according to claim **1** including aligning pins projecting from the pressing surface of each of said platens.

3. A press according to claim **1** wherein said energizing means includes a plug for connection to an electrical energy source, said valve being movable into said first position when said plug is connected to the electrical energy source.

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