United States Patent
Schweizer

[15] 3,661,074
[45] May 9, 1972

[54] APPARATUS FOR FEEDING AND/OR DISCHARGING A PRESS

[72] Inventor: **Rolf Schweizer**, Adliswil, Switzerland

[73] Assignee: **Fred Fahrni**, Zurich, Switzerland

[22] Filed: **Feb. 25, 1970**

[21] Appl. No.: **13,910**

[52] **U.S. Cl.** ..... **100/215**, 18/16 F, 100/295, 310/13
[51] **Int. Cl.** **B30b 15/30**
[58] **Field of Search** ..... 100/45, 215, 93 P; 214/16 B; 310/13; 18/16 F; 308/DIG. 7

[56] **References Cited**

UNITED STATES PATENTS

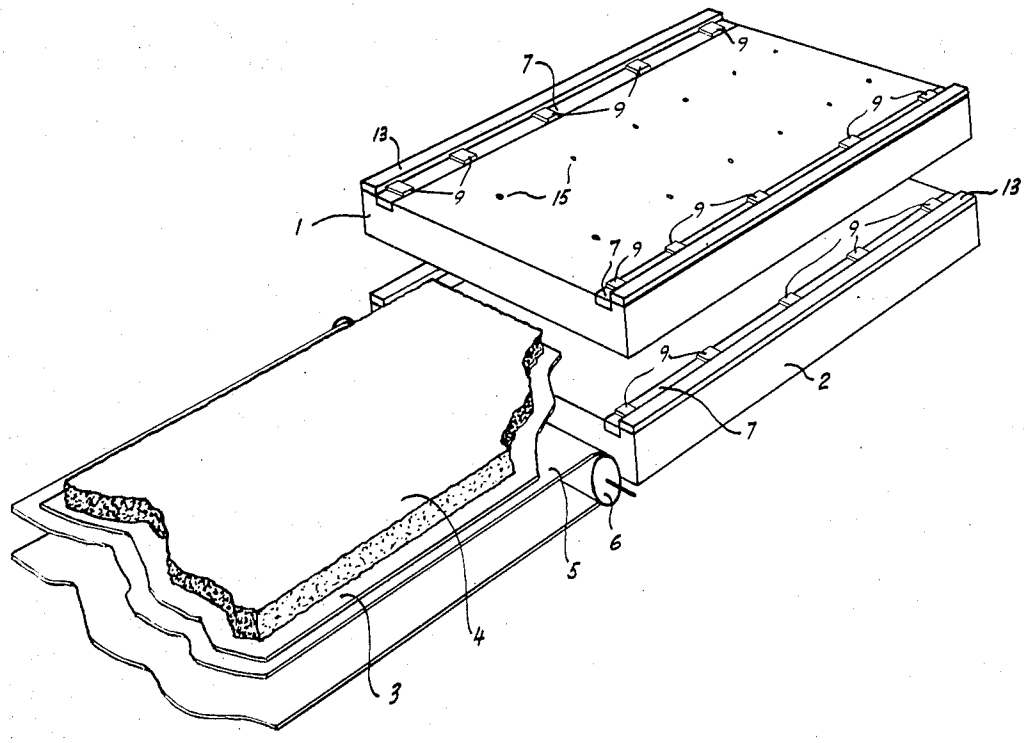
2,975,701	3/1961	Munschauer et al.	100/215 X
3,119,728	1/1964	Janapol	100/93 P X
3,226,764	1/1966	Hostettler	100/215 X
3,390,854	7/1968	Sherburne	308/DIG. 7
3,428,505	2/1969	Siempelkamp	100/215 X
3,426,887	2/1969	Ward et al.	310/13 X
3,450,030	6/1969	Hütz	100/215 X
3,463,299	8/1969	Poole	100/215 X

Primary Examiner—Walter A. Scheel
Assistant Examiner—Philip R. Coe
Attorney—James M. Heilman and Heilman & Heilman

[57] **ABSTRACT**

The present invention relates to apparatus for feeding and/or discharging a single- or multi-stage, and preferably heated, press with at least one upper and one lower press plate, between which is passed a flat conductive metal plate or conductive caul with mass to be compressed located thereon. This invention relates in particular to apparatus associated with a heated press for producing wood chip boards, fiber boards, plywood panels, etc. The conductive metal plate acts as the moving portion of a linear induction motor, having a stator which includes a plurality of windings and magnetic cores for converting multi-phase current power into a moving magnetic field which pulls the conductive plate into and out of the press space.

5 Claims, 2 Drawing Figures



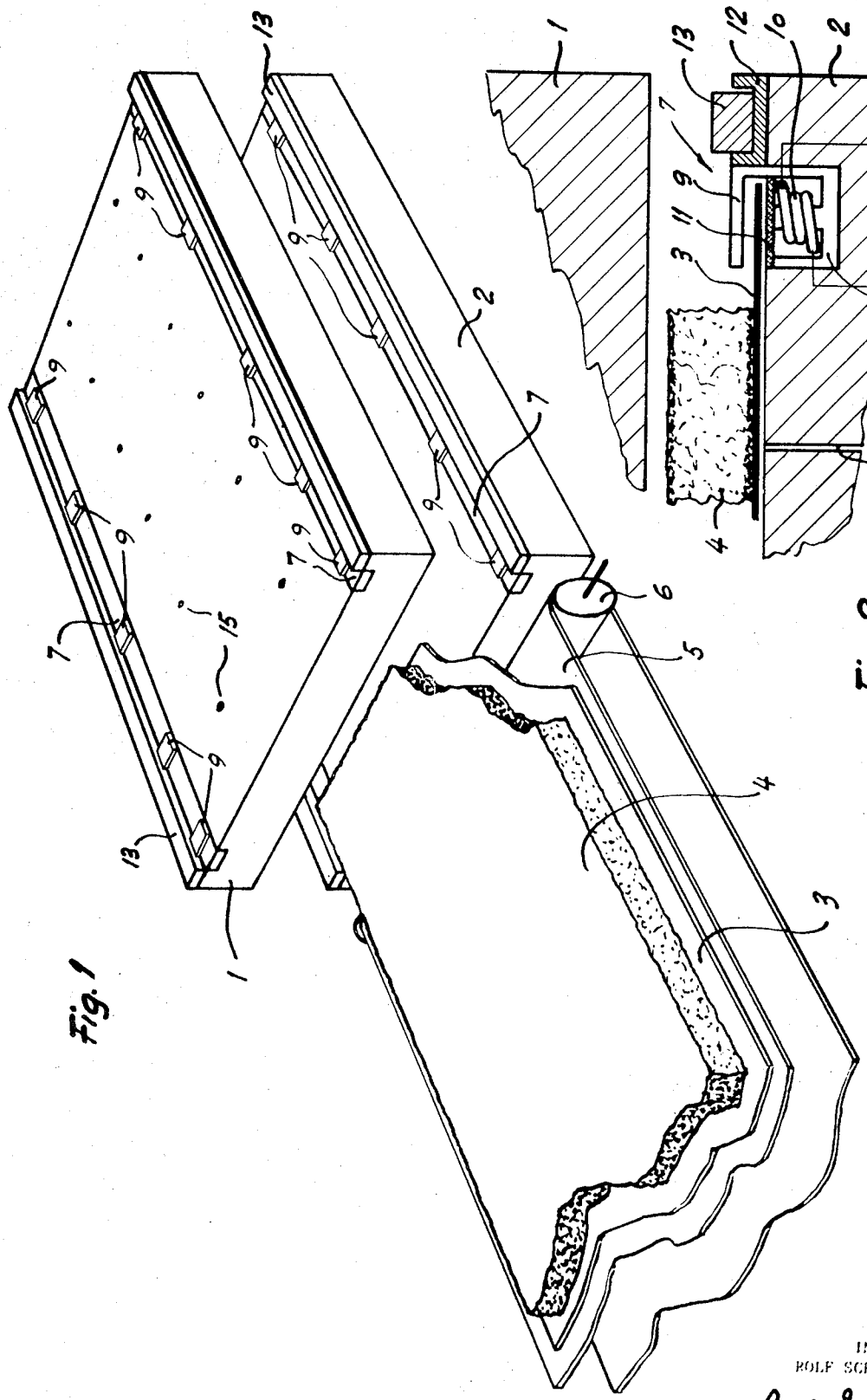


Fig. 1

Fig. 2

INVENTOR
ROLF SCHWEITZER

James D. Heilman
ATTORNEY

APPARATUS FOR FEEDING AND/OR DISCHARGING A PRESS

The present invention relates to apparatus for feeding and/or discharging a single- or multi-stage, and preferably heated, press with at least one upper and one lower press plate, between which is passed a flat metal plate or caul with the mass to be compressed located thereon. This invention relates in particular to apparatus associated with a heated press for producing wood chip boards, plywood panels, etc.

Up to the present time various devices have been proposed and used for the purpose above indicated. For example, pushing in devices exist with which the loaded sheet steel or aluminum plates are moved between the press plates with the aid of special pushers. If the plates are long, which is the tendency at present, and are made from thin sheet metal, pushers cannot be used for obvious reasons. It has been found that the longer the plates, the more it is necessary to draw the loaded sheet metal plates into the press with the aid of conveyor means, including chains, disposed laterally of the pressure plates, and then remove the plates again on completion of the pressing process. However, such conveyor means require much space at an inconvenient point, are subject to considerable polution, and are attacked by chemical vapors particularly when located beside a heated press for pressing a mass mixed with synthetic binder. Housing the bulky conveying means is particularly difficult if the press is very long and has several stages.

The aim of the invention is to provide apparatus of the initially defined type without the described disadvantages. This aim is achieved by at least one primary part of a linear alternating current induction motor connected by means of plural phase conductors with an external current source, the induction motor windings being countersunk into the lower pressure plate. The primary part extends in the direction of the movement to be effected by the sheet metal plates and has its pole faces upwardly directed, said sheet metal plates serving as a secondary part of the linear induction motor.

The provision of at least one primary part of a linear induction motor countersunk into the pressure plate, preferably fed by a three-phase alternating current supply, results in a very compact drive for the sheet metal plates without additional mechanically moved parts. For example by casting the primary part with synthetic resin or another suitable filler it is without difficulty possible to protect this effectively against mechanical damage and/or attacks by gases or vapours.

The linear alternating current induction motor is known per se. In the new application proposed according to the present invention it has quite specific advantages because the metal plates to be moved, which are in any case present, act as the secondary part of the motor. The so-called linear motor is derived from the three-phase current asynchronous motor with a squirrel cage rotor. It is simple in construction, relatively light and extremely reliable. The primary part is in principle no different to a stretched stator wound off in a plane of an asynchronous motor fed with three-phase current. In this type of flat inductor an electromagnetic moving field is generated by the three-phase current which moves synchronously along the poles of the flat inductor. This field induces voltages in the conductive plate leading to rotary currents, so that a force acts on the plate to move it into the press.

The accompanying drawings show an exemplified embodiment of the apparatus according to the invention.

FIG. 1 is a perspective view simplified in many ways, of a multi-stage press equipped with an apparatus according to the invention.

FIG. 2 is a section through a part of the apparatus according to FIG. 1 in which certain parts are shown somewhat more clearly.

The press shown in FIG. 1 serves for the production of solid boards of wood chips or the like mixed with a binder. To this end, the press plates 1 and 2 are heated by means not shown, and known per se such as a heating coil through which flows steam, at a temperature of for example 180° C. Obviously the press is equipped in the conventional manner with a supporting frame and hydraulically operated press plunger. This press has 10 or more stages, but only one is completely visible. For this stage, the upper press plate is designated as 2. However, it should be noted that the invention can be applied to both single-stage and also multi-stage presses. The fact that the linear motor has no movable parts, other than the conductive plate, makes the device according to the invention independent of the number of stages, the width of opening of the press and the type of the press opening and closing mechanisms.

In the selected embodiment the feed and discharge device has in particular the task of introducing into the press a chipboard blank 4 located on a plate 3 of sheet aluminum or the like which is brought up directly against the front of the press by means of a conveyor belt 5 guided over a roller 6 and after completion of the hot pressing operation of moving the plate 3 together with the pressed board from the press.

Feeding and discharging the press takes place with the aid of the linear motor fed by the three-phase current supply. In this connection, two primary parts of a linear three-phase current induction motor are countersunk into the lower pressure plate of each stage. The two primary parts are generally designated with the number 7. The two straight primary parts extend in the direction of movement of the loaded sheet metal plates 3 and are positioned in immediate proximity to the two longitudinal edges of the press plate. The drawing according to FIG. 2 shows the pole faces upwardly directed. Hence the induction motor for each stage of the press comprises a plurality of primary parts 7 and a secondary part, formed by the conductive plate 3 which is located within the press area.

The design of the linear motor stator is shown more clearly in the section in FIG. 2. The linear inductor has a specific number of poles arranged at regular spacings behind one another, each of which comprises a set 8 of transformer laminations. The actual core part of each stator pole is provided with a winding 10. Care must be taken to ensure that by appropriate winding of the poles and a corresponding interconnection of the winding an electromagnetic moving field occurs across the linear inductors. The transformer laminations have an upwardly open E shape. In addition, one of the two outer legs of each set of laminations is upwardly extended and bent back, resulting in the formation of a type of upper shell 9 which improves the magnetic power flux and increases the efficiency of the linear motor. In addition, the upper shell 9 can serve as a longitudinal guide for the loaded metal plates 3. To prevent premature wear of these guides it is advantageous to coat the upper shell leg 9 on the inside with bronze, another metal, a plastic or the like. In certain cases spacer strips or supports therefor can be used as guide members. In the present embodiment the spacer strips 13 are interchangeably fixed in support bars 12.

It has proved advantageous to countersink the pole faces of the primary part of the induction motor relative to the upper pressing surface of the press plate carrying this primary part. As shown in FIG. 2 it is possible to cover the upwardly open side of each primary part. It is recommended that for the flat coverings 11 shown in the drawing a low-friction, non-metallic material should be used. Thus the upper surface of each covering 11 can be in the same plane as the upper pressing surface of the press plate. The friction between the sheet metal plate 3 and the bearing surface of the press plate can be reduced in another way. To this end, the interior of the press plate has channels 14 which open into the upper pressing surface in the form of openings 15. By a suitable supply to the channels 14 of compressed air an air cushion can be produced between the pressing surface and the plate 3 and in this way the loaded plates can be displaced with a very small expenditure of power. It is also possible to coat the underside of the plates 3 with a friction-reducing material.

The stator poles and the windings connected to a power source by means of cables (not shown) can be particularly well protected against external influences by filling the cavities of the primary parts with a filler made from a solidifiable

insulating material. To prevent too great heating of the primary parts it is advisable to introduce cooling coils into the cavities of the primary parts, through which can stream or flow water, cooled air or another cooling medium. In certain cases hollow conductors in conjunction with a cooling medium feeding means are used for winding the stator poles, therefore using these windings at the same time for conveying the cooling medium. For example, a glass fibre fabric or another heat-resistant insulating material can be wound round the windings. Depending on the loading or heating of the electrical windings, the general cooling conditions and the temperature of the press plate, in certain circumstances the primary part or parts of the induction motor is inserted in such a way in the press plate so as to be insulated against heat transfer.

In the embodiment, linear three-phase current induction motors are used both for feeding and discharging the press. In order that the metal plates, each loaded with a blank **4** and taken over by the conveyor belt **5** are stopped at the prescribed point after introduction into the press, a photoelectric cell control system or limit switch operated mechanically by the plates can be used, this control means acting on special switching means by which the windings of the primary parts can be disconnected. These switching means can also serve to connect the windings of each primary part to a particular phase conductor of the power supply for the purpose of braking and stopping the loaded metal plates. Furthermore, the switching means can serve simultaneously to interrupt the compressed air supply to the channels **14**. Obviously it is also finally possible to have mechanical arms or the like near the press plates and to control these arms electromagnetically, pneumatically or hydraulically in such a way that on introducing the loaded plates **3** they will act as an obstacle in the path of same, whereby an accurate positioning of the plates is ensured.

The metal plates **3** are made of a conductive metal such as aluminum, copper, brass or a stainless steel. The efficiency of the linear motor can be increased by providing the secondary part, i.e. the sheet metal plates **3** with stampings, cut outs or the like at regular intervals in the areas facing the stator poles.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Apparatus for feeding and discharging a press having an upper and a lower press plate comprising: a flat conductive movable plate with an article to be pressed located thereon, said conductive plate for movement into and out of a space defined by the two press plates, a stator portion of a linear induction motor having a plurality of windings, each enclosing a ferromagnetic core for projecting alternating magnetic flux into the plane of the conductive plate for moving the plate into and out of the press, said windings connected in such a manner to a three-phase source of alternating current power as to generate a magnetic field moving in a direction into and out of the press, said ferromagnetic core having one end adjacent to one surface of the conductive plate, and a ferromagnetic shell extending from the other end of said core around the edge of the conductive plate to the other surface of said plate, forming a magnetic air gap.

2. Apparatus according to claim **1** wherein the windings are positioned adjacent to the edges of the lower press plate.

3. Apparatus according to claim **1** wherein lateral guides are positioned at the edges of the lower press plate parallel to the motion of the plate for retaining the conductive plate within the press space.

4. Apparatus according to claim **1** wherein the lower press plate is provided with a plurality of conduits for applying compressed air to the underside of the conducting plate for reducing the sliding friction between the lower press plate and the conducting plate.

5. Apparatus according to claim **1** wherein the underside of the conducting plate is coated with a friction reducing material.

* * * * *