June 21, 1949. M. F. CHUBB 2,474,091

MACHINE FOR PROCESSING STORAGE BATTERY PLATES

Filed Feb. 25, 1944 2 Sheets-Sheet 1

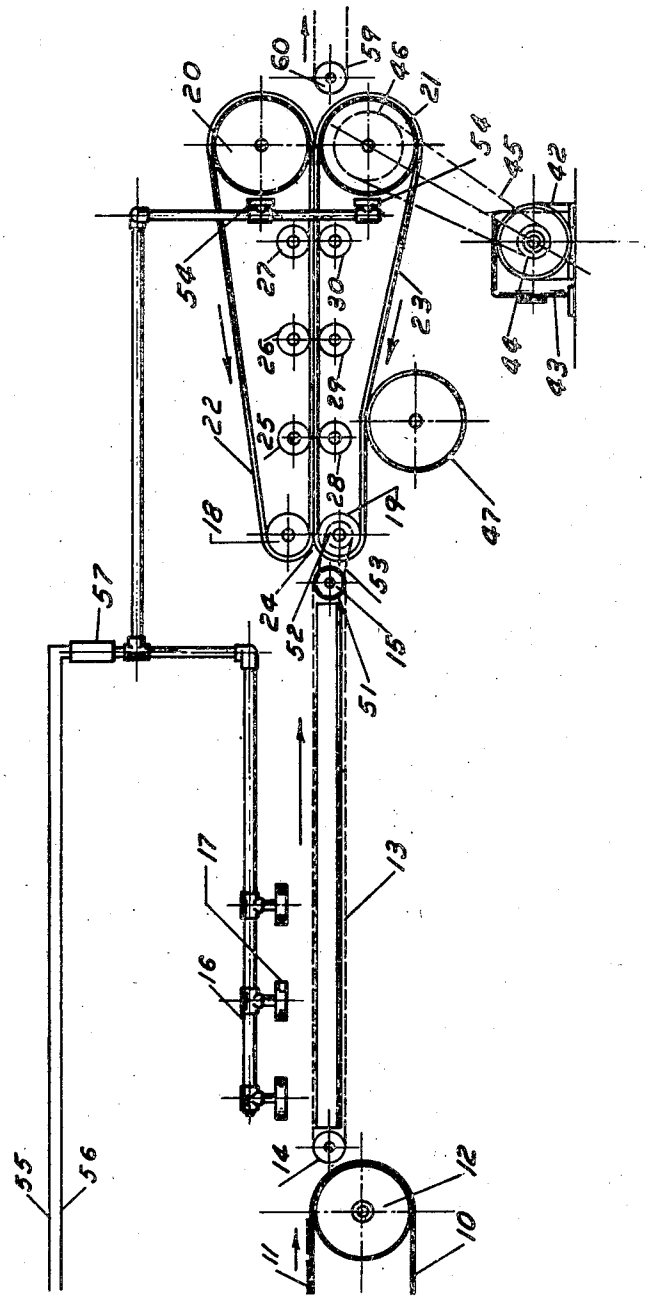


FIG-1

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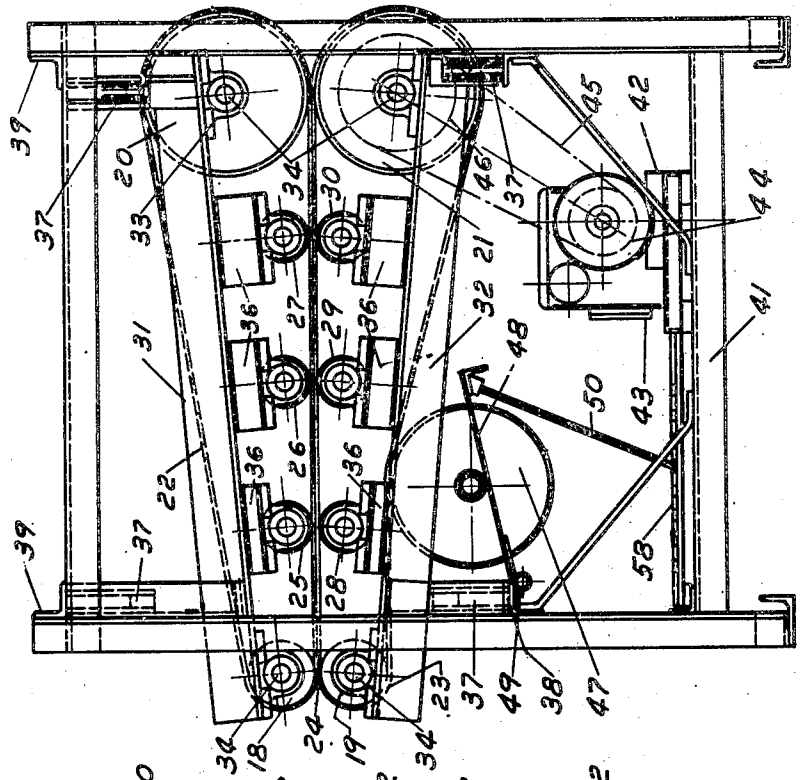


FIG 2

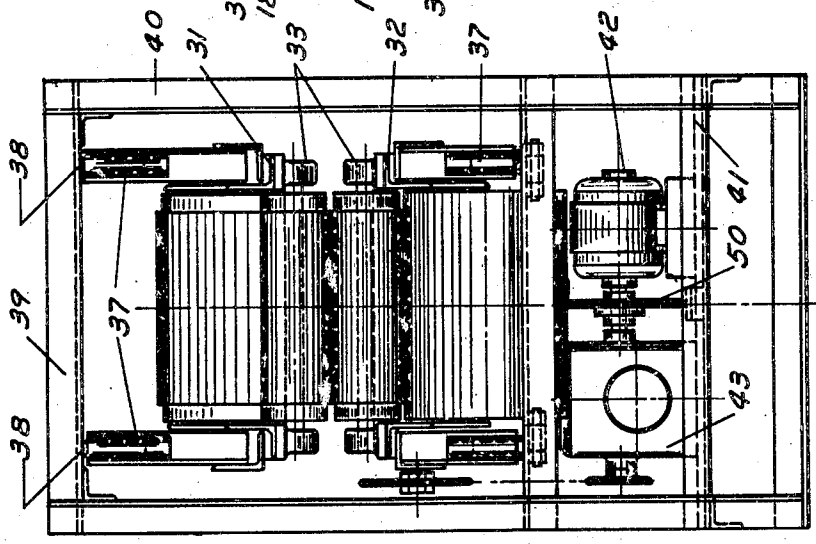


FIG 3

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MACHINE FOR PROCESSING STORAGE BATTERY PLATES

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4 Claims. (Cl. 34—71)

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This invention relates to a machine for processing storage battery plates for lead accumulators. A co-pending divisional application, Serial No. 540,668, claims the process.

The object of the invention is to provide an expeditious apparatus for preliminarily drying the pasted plates and for simultaneously pressing the paste onto the grids and drying it further. Both positive and negative plates may be processed.

Among the advantages of my machine are (*a*) its high rate of production; (*b*) its ease and certainty of control; and (*c*) its easy demountability for the purpose of renewing the drying belts.

Referring to the accompanying drawings.

Figure 1 is a side elevation of the machine with supporting frames and other details non-essential for showing the operation, omitted.

Figure 2 is a side elevation of the machine, with omission of the heating or "flash" section, but including the frame and other details.

Figure 3 is an end view taken from that end at which the plates enter.

Referring again to Figure 1, 10 is a conveying belt delivering plates 11 from the machine (not shown) which applies the paste to the grids. The belt travels over a pulley 12. The purpose of this showing will presently be clear.

The belt 10 is arranged to deliver plates 11 to another belt 13 which travels over pulleys 14 and 15 which rotate at a controllable slow speed. The belt 13 is made of steel links or other fireproof or fire resisting material into a web or chain. Above it is arranged a gas-delivery manifold 16 to which are connected a number of radiant heat gas burners 17 in series over the belt. The burners are of the radiant heat type, preferably of "Burdett" make. Electric radiant heaters may be substituted. The burners are located over the chain belt 13 at the plate-entrance end; a free space, clear of burners, is left at the exit end so that the plates may cool and also evaporate moisture rapidly before entering the next or compressing and drying section of the machine. The flash section just described is arranged to run at a variable speed, but faster than the pasting machine belt 10. The length of the flash section may approximate 5' to 12'.

The next section, for squeezing and drying comprises a pair of small driven rolls, one of which 18 is an upper roll and 19 a lower one. At the opposite end of the section are a larger pair of driving rolls, one of which, 20, is the upper one and 21 the lower. Over each pair of rolls, i. e., one driver and one driven, there is provided a thick woven absorbent belt or pad, preferably cotton, the upper belt being 22 and the lower one being 23. The belts travel together in close contact unless some object, say a battery plate is fed into the receiving nip 24 which is, in fact, arranged to receive these objects from chain belt 13. The speed of belts 22 and 23 approximates 45 linear feet per minute, but may be varied considerably.

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It is now evident that plates entering nip 24 will be squeezed and dried by belts 22 and 23 while being carried along between them to that end of the machine from which the belts are driven. In order to increase the pressure, however, a series of pressure rolls, of which 25, 26 and 27 are the upper members and 28, 29 and 30 are the lower ones, are provided. Each upper roll is directly over its corresponding lower roll and each is idled by the friction of the respective upper and lower belts passing over it. In practice, a length of 4' to 7' has been found practicable for the squeezing and drying section. While three pairs of pressure rolls are here described, the number is not limited.

Referring now to Figure 2, the construction employed to mount the various members is made clear. The rolls 18—20 and 19—21 are spaced by two pairs of spacing beams of stringers of which 31 is the upper pair and 32 the lower. Of these pairs, there is one beam on each side of each roll. Journal boxes 33 are mounted on each beam, which is perforated and provided with a bearing surface in the perforation to permit smooth rotation of roll-supporting shafts 34. Approximately midway between the rolls and extending from each beam pair, 31 and 32, on stringer beams 31 and 32, are mounted tabs or extensions 35 in which the pressure rolls 25—26—27 and 28—29—30 are free to rotate, i. e., be idled by belts 22 and 23 respectively. The stringer beams 31 and 32 also function as belt guides, as will be seen in Figure 3.

On the surfaces of beam pairs 31 and 32 opposite to those carrying frameworks 35, there are disposed near the driving and driven pulley, floating mountings, 37. These are sockets made of short lengths of pipe which are internally smooth. The mountings cooperate with studs 38, which are attached to the cross beams 39, of which there are four, two upper and two lower. The cross beams are members of a conventional box-type frame 40 made preferably of angle irons.

It will now be seen that the upper and lower assemblies of rolls and belts float within the rectangular frame 40 positioned horizontally by the fit of studs 38 within the mountings 37. Nevertheless, the upper assembly is free to move ver-

tically to accommodate battery plates passing between the belts 22 and 23. Such mounting is of great convenience when belts must be changed because the roll assemblies can be lifted out for the purpose after removing the upper cross members 38. The belts can be then slipped off and on the roll assemblies from the sides thereof.

Within the lower interior of frame 40 there is a platform 41 upon which the driving means for roll 21 is mounted. An electric motor 42 preferably for direct current, drives a speed reducer 43 from the sprocket 44 of which a drive chain 45 actuates roll 21 by means of a tight sprocket 46. Roll 21 drives roll 20 by the friction between belt 23 and belt 22. The former drives the latter.

In order to keep belt 23 sufficiently tight to exert any efficient driving action, tightening idler 47 is mounted under that belt near the driven roll 19. It is rotatably positioned within a frame 48 pivoted to frame 40 at 49. Its adjustment is determined by the position of a rod 50 pivoted to frame 48 which is held at its outer extremities in detents in the surface of a member 53 of the platform 41.

It is desirable that the speed of conveyor 13 of the flash section should be equal to the speed of the squeezing and drying section. To this end, sprockets 51 and 52 are provided at the end or ends of roll 19 and of roll 15. Drive chain 53 connects the two sprockets.

During the operations, belts 22 and 23 become saturated with moisture unless provision is made for drying them. I accomplish this by providing radiant heat gas burners 54 positioned between belts 22 and 23 respectively and playing upon the surfaces of rolls 20 and 21 respectively.

When the machine is first started, it is essential that the burners 17 and 54 should be radiating. This implies that they must have been started some time previously since the refractory-hooded burners employed take a considerable time to become fully heated. The following arrangement is provided to give the burners advance operation:

55 and 56 are the leads of an electric circuit activating the motor (not shown) which drives the belt 10 of the pasting machine. Across these leads is solenoid valve 57. It controls the flow of gas to burners 17 and burners 54 respectively. As soon as the pasting machine motor begins to operate, the solenoid valve is opened, thereby heating the gas burners well in advance of the time that they are needed. When the pasting machine motor is re-energized, the solenoid valve closes except for enough flow to serve as a pilot light. If the heating were electric, the equivalent of the solenoid valve would be a magnetic switch.

From the above description, the operation of the machine will be well undertood by those skilled in the art. To take the plates from the machine, I prefer to provide a pair of slow-moving carrier chains 59 moving over sprockets 60 as shown in Figure 1.

In effect, the drying and squeezing section of the machine is a double conveyor belt comprising substantially identical upper and lower sections designed to movably abut each other with their belts and to exert pressure on objects while moving them through the section between the abutting belts.

The purpose of the flashing section is to partially dry the plate for the squeezing section by evaporating moisture from the paste by opening cracks in the latter. It is not necessary to heat both sides of the plate. The combined squeezing

and absorbent action of the belts on the heated plate removes additional moisture.

The squeezing and absorbent action also serves to heal any checks and cracks formed during the flashing section which have now served their purpose of allowing the escape of moisture, and in doing so compresses the paste so that the resulting plates have a rugged structure and good handling characteristics. In this way, there is a novel and cooperative relation between the two sections of the machine.

From the foregoing it will be evident that a method of battery plate processing involving the use of more than the operations of a single machine has been disclosed. The method comprises the steps of first pasting the grid, then flashing the pasted grid with radiant heat or oxidizing-flame contact for 4 or 5 seconds on both sides of the resultant plate, followed by pressing between woven absorbent textile surfaces and curing in close contact (preferably stacked relation) for between 10 and 24 hours.

While I have shown the gas burners, in Figure 1, to be arranged over the conveyor, they may be positioned under it or in any position so that a zone of high heat is established about the path of the plates.

For certain kinds of plates the time of flashing must be considerably longer, so that the total time of exposure to high heat should be in general taken to be 4 seconds to 30 seconds, although for ordinary usage 4 or 5 seconds will be sufficient.

I claim as my invention:

1. A battery plate processing machine comprising a frame, upper and lower cross members within said frame, a pair of larger rolls arranged to form a nip at one end of said frame and rotatably supported by the latter, a pair of smaller rolls arranged to form a nip at the opposite end of the frame and rotatably supported by the latter, an absorbent fabric belt disposed about each roll pair comprising a larger and a smaller roll, said belts being arranged to run in a parallel abutting relation for a substantial part of their travel, two spacing beams separating each larger and smaller roll at opposite sides thereof, bearing surfaces for said rolls in the end portions of each of said spacing beams, two series of pressure-increasing rolls supported by each pair of spacing beams and each series making contact with one of said belts at the parallel running portion thereof, and a plurality of floating mountings arranged cooperatively on the cross members of the frame and substantially the ends of the spacing beams whereby to anchor each assembly of spacing beams, rolls and belt against horizontal movement but free to allow limited vertical movement and easy removability of each assembly from the frame.

2. A battery plate processing machine comprising a squeezing and drying section, said section having a frame, pairs of larger driving rolls and smaller driven rolls mounted crosswise in said frame at opposite ends thereof, to form nips, spacing members arranged to preserve the horizontal distances between said rolls, an absorbent textile belt disposed about each pair of said rolls so as to be driven equally thereby, said belts being arranged to abut each other in parallel relation in a substantially-horizontal course, a motor and a speed reducer operatively connected therewith for driving one of said driving rolls and thereby said belts, a series of pressure rolls arranged in coinciding relation above and below said belts and substantially supported by said spacing

members to provide pressure on battery plates moved between the said rolls and between the belts, and means for heating at least one pair of said rolls to keep the belts in absorbent condition.

3. A battery plate processing machine comprising a pair of rolls arranged to form a nip, means for rotatably supporting said rolls, a second pair of rolls arranged to form a nip spaced from the first, means for rotatably supporting the second pair of rolls, absorbent fabric belts disposed respectively about rolls to run in parallel facial relation for a substantial part of their travel, upper and lower support members separating the rolls of said pairs at each end of said machine, and a plurality of pressure increasing rolls supported by said support members, each pressure roll making contact with one of said belts at the abutting portion thereof, said pressure increasing rolls being arranged in pairs forming nips, and means arranged at at least one end of at least one support member to allow said support member and rolls associated therewith to move in a vertical direction.

4. A battery plate processing machine which comprises a pair of upper and lower beams substantially coextensive and arranged in spaced relationship to one another, pairs of rolls rotatably mounted at the opposite endwise portions of said beams, the rolls of said pairs forming nips, absorbent fabric belts disposed about said rolls to pass in facial engagement through the nips and arranged to run in parallel abutting relation for a substantial part of their travel, pressure rolls respectively mounted upon said beams intermediate said pairs of rolls for engagement with the opposite faces of said belts, the upper

beam and roll assembly resting upon the lower beam and roll assembly, and guides to permit upward movement of the upper assembly, whereby battery plates carried between said belts are subjected to pressure to consolidate battery paste disposed on said plates and absorb moisture therefrom.

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