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(54) **Apparatus for manufacturing molded pulpboards**

Vorrichtung zur Herstellung von Faserplatten aus geformter Pulpe

Dispositif de fabrication des panneaux fibreux moulés

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Description

[0001] This invention relates to an apparatus for manufacturing molded paperboards.

[0002] Referring to Figures 1 and 2, a conventional apparatus 1 for manufacturing molded pulpboards includes a stationary base 11 and a tank 12 disposed on the stationary base 11. An upright partition 121 is connected to the bottom of the tank 12 to define two chambers 122, 123 in the tank 12. The height of the partition 121 is lower than that of the side walls of the tank 12. A pulp supplying device 13 is connected to the tank 12 so that an aqueous waste pulp suspension can be pumped into the tank 12 via a first pipeline 131, and so that the aqueous waste pulp suspension will flow back to the pulp supplying device 13 via a second pipeline 132. An actuating cylinder 136 is mounted to the bottom of the tank 12, and has a telescopic rod 133 extending upwardly therefrom and an elongated support base 134 connected to an upper end of the telescopic rod 133. The telescopic rod 133 can be driven by the actuating cylinder 136 to move up and down. The top face of the support base 134 has a plurality of juxtaposed cover plates 135 fastened thereon. Each of the cover plates 135 has a female mold 14 disposed thereon. Each of the female molds 14 has a sheet of net member 142 disposed thereon and a plurality of through holes 141 formed in the mold cavities thereof. A guide rail 15 is provided above the tank 12, and has an oil-hydraulic cylinder 16 and a vacuum pump 18 provided thereon. A plurality of male molds 17 are provided on the bottom face of the guide rail 15, and are connected operatively to the oil-hydraulic cylinder 16 and the vacuum pump 18. Each of the male molds 17 confronts a corresponding one of the female molds 14. A conveyor 19 is disposed beside the tank 12 on the stationary base 11 and has a conveying belt 191 and a plurality of spaced carrier plates 192 connected to the conveying belt 191. The downstream portion of the conveyor 19 passes through a drying device 10.

[0003] In use, the actuating cylinder 136 is actuated to drive the telescopic rod 133 to retract, resulting in descent of the support base 134 until the female molds 14 are lower than the top edge of the partition 121. The aqueous waste pulp suspension is pumped into the chamber 122 of the tank 12 via the first pipeline 131 by the pulp-supplying device 13 and overflows to the chamber 123. The partition 121 permits the aqueous pulp suspension in the tank 12 to flow in a steady state. When the female molds 14 are immersed in the aqueous pulp suspension, the fiber material will precipitate onto the net members 142. Water will be swept out from the clearance between the female molds 14 and the cover plates 135 through the through holes 141 when the support base 134 is raised by the telescopic rod 133 that is driven by the actuating cylinder 136. The aqueous pulp suspension in the chamber 123 flows back into the pulp-supplying device 13 via the second pipeline 132. There-

after, the oil-hydraulic cylinder 16 is actuated to move the male molds 17 over the female molds 14 and is then lowered to compress the pulp material precipitated on the net members 142 of the female molds 14 in order to form molded pulpboard blanks 2. The blanks 2 are attached to the male molds 17 by means of the suction force of the vacuum pumps 18. The male molds 17 with the blanks 2 are then driven to move upwardly to separate from the female molds 14 and to move to and above the carrier plates 192 on the conveyor 19. The blanks 2 attached to the male molds 17 drop onto the carrier plates 192 when the vacuum pumps 18 are deactivated. The blanks 2 are delivered through the drying device 10 by means of the conveyor 19 and are dried. The final products are thus obtained.

[0004] However, the conventional apparatus 1 for manufacturing the molded pulpboards suffers from the following disadvantages:

1. Since the through holes 141 in the female molds 14 and the net members 142 on the female molds 14 are often blocked by the pulp material, periodical shutdown to remove the pulp material from the through holes 141 and the net members 14 is required. Therefore, the production yield of the molded pulpboards is adversely affected.
2. In a molding step, few blanks 2 are disposed on a single row of carriage plates 192. The conveyor 19 is then moved forward a predetermined distance and stops for carrying the blanks 2 from the male mold 17 that are to be produced in the next molding step. Therefore, both the production yield and the production speed are low.
3. Because only one tank 12 is employed to produce the molded pulpboards, the patterns of the molds 14, 17 are limited. To produce molded pulpboards with a variety of patterns, the operator must shut down the aforementioned conventional apparatus 1 and replace the molds with new ones having different patterns. This will affect adversely the production yield and speed.

[0005] EP-A-616,076 discloses an apparatus for manufacturing molded pulpboard comprising a molding device arranged at an upstream edge of a belt, and further molding devices arranged at either side of the belt. The molding devices each comprise a pulp tank, a mold mounted on a movable support above the tank, such that the mold can move between the tank and the conveyor. The conveyor is arranged to convey pulpboards deposited thereon to a dryer.

[0006] US-A-5 656,135 discloses a molding machine having a large number of ports for mounting a variety of molds. The upper and lower molds are exchangeable giving adaptability in mold mounting.

[0007] At least preferred embodiments of the present invention seek to provide an apparatus for manufacturing molded pulpboards that can have a high production

yield and speed and that can produce molded pulpboards of different patterns at the same time as compared to the aforementioned conventional apparatus.

[0008] Various aspects of the invention are set out in the accompanying claims.

[0009] According to an embodiment of the present invention, an apparatus for manufacturing molded pulpboards comprises a conveyor, a plurality of molding devices and a drying device. The conveyor has two opposite sides and upstream and downstream portions. The molding devices are arranged movably adjacent to the opposite sides and the upstream portion of the conveyor. Each of the molding devices has a movable seat, a tank disposed on the movable seat, a female mold disposed in the tank, a cantilever support connected to the movable seat in a vertically movable position above the tank, a male mold mounted on the cantilever support, a first driving device for moving the cantilever support toward and away from the tank in order to engage and disengage the female and male molds, a pickup device mounted on the cantilever support and adapted to transfer a molded pulpboard blank formed on the female mold from the female mold to the conveyor, and a pulp supplying device connected detachably to the tank and adapted to supply an aqueous pulp suspension to the tank. The drying device is disposed adjacent to the downstream portion of the conveyor, and is adapted to dry the molded pulpboard blank on the conveyor.

[0010] An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic side view of a conventional apparatus for manufacturing molded pulpboards;
Figure 2 is a top view of the conventional apparatus for manufacturing molded pulpboards of Figure 1;
Figure 3 is a top view of a preferred embodiment of an apparatus for manufacturing molded pulpboards according to the present invention;
Figure 4 is a schematic side view illustrating the preferred embodiment of Figure 3 in a first operative position; and
Figure 5 is a schematic side view illustrating the preferred embodiment of Figure 3 in a second operative position.

[0011] Referring to Figures 3 and 4, a preferred embodiment of an apparatus 3 for manufacturing molded pulpboards according to the present invention is shown to comprise a plurality of molding devices 4, a conveyor 5 and a drying device 6. The molding devices 4 are arranged movably adjacent to the opposite sides and the upstream portion of the conveyor 5 on a stationary base 21. The drying device 6 is disposed adjacent to the downstream portion of the conveyor 5 on the stationary base 21. Each of the molding devices 4 includes a movable seat 41, a tank 42 disposed on the movable seat 41, a female mold 43 disposed in the tank 42, a cantilever support 44 connected to the movable seat 41 in a vertically movable position above the tank 42, a male mold 45 mounted on the cantilever support 44, a first driving device 46 for moving the cantilever support 44 toward and away from the tank 42 in order to engage and disengage the female and male molds 43, 45, a pickup device 48 mounted on the cantilever support 44 and adapted to transfer a molded pulpboard blank 7 formed on the female mold 43 from the female mold 43 to the conveyor 5, and a pulp supplying device 47 connected detachably to the tank 42 and adapted to supply an aqueous pulp suspension to the tank 42 in a conventional manner.

[0012] The movable seat 41 of each of the molding devices 4 has a guide rail 411 disposed on an upright portion thereof in order to guide the cantilever support 44 to move vertically, and a plurality of casters 412 mounted to the underside of the movable seat 41. Each of the tanks 42 has an upright partition 422 connected to the bottom of the tank 42 and dividing the tank 42 into two receiving chambers 423, 424. The height of the partition 422 is lower than that of the side walls of the tank 42. Each of the tanks 42 further has an actuating cylinder 426 that is mounted to the bottom thereof, and a telescopic rod 425 that extends upwardly from the actuating cylinder 426 and that is connected to a support base 421 at its upper end. Each of the female molds 43 is fastened to the support base 421 and has a sheet of net member 431 disposed thereon. The cavities of the female molds 43 have through holes 432 formed therein. The pulp-supplying device 47 is connected to the receiving chambers 423, 424 via pipelines 471, 472, respectively. Each of the pickup devices 48 includes a second driving device 481 that is disposed on the cantilever support 44 and that is capable of moving the male mold 45 to and back from the conveyor 5, and a vacuum pump 482 that is disposed on the cantilever support 44 and that can exert a suction force on the female mold 43 through the male mold 45.

[0013] The conveyor 5 includes a conveying chain 51 and a sprocket assembly 52 for driving the conveying chain 51.

[0014] Referring to Figures 4 and 5, in use, the molding devices 4 are moved near the opposite sides and the upstream portion of the conveyor chain 51 of the conveyor 5. An aqueous waste pulp suspension is supplied to the pulp supplying devices 47. The pulp supplying devices 47 are actuated in order to pump the pulp suspension into the chambers 424 in the tanks 42 through the pipeline 472. The pulp suspension in each of the chambers 424 then overflow past a corresponding one of the partitions 422 and into the chamber 423. The pulp suspension in the chambers 423 will flow back to the pulp supplying devices 47 via the pipelines 471. The partitions 422 permit the pulp suspension in the tanks 42 to flow in a steady state. At this time, the female molds 45 are immersed in the pulp suspension, and the fiber material will precipitate onto the net members 431

on the female molds 43. Water will be swept out from the bottom of each of the female molds 43 through the through holes 432 when each of the support bases 421 is raised by a corresponding one of the telescopic rods 425. Then, the first driving devices 46 are actuated to descend the cantilever supports 44 to permit engagement of each of the male molds 45 and a corresponding one of the female molds 43 in order to form a molded pulpboard blank 7 therebetween, as shown by the phantom lines in Figure 4. Thereafter, the vacuum pumps 482 are actuated to exert a suction force onto the molded pulpboard blanks 7 through the male molds 45. In the meantime, the first driving devices 46 are actuated again to drive the cantilever supports 44 to move upwardly. As a result, the molded pulpboard blanks 7 are moved upwardly with the male molds 45.

[0015] Next, with reference to Figure 5, the second driving devices 481 of the pickup devices 48 are actuated to drive the male molds 45 with the molded pulpboard blanks 7 horizontally to and above the conveying chain 51 of the conveyor 5. At this time, the vacuum pumps 482 are deactivated to permit the molded pulpboard blanks 7 to separate from the male molds 45 and drop onto the conveying chain 51. The molded pulpboard blanks 7 then pass through the drying device 6, and are dried by the same to form the final products.

[0016] By controlling the start time of each of the molding devices 4 with the use of a timer (not shown), the molded pulpboard blanks 7 can be placed on the conveyor 5 in sequence as shown in Figure 3. In this way, the number of the molded pulpboard blanks 7 that are disposed on the conveyor 5 can be increased dramatically.

[0017] Advantages of the apparatus for manufacturing molded pulpboards according to at least preferred embodiments of the present invention include:

1. The molding devices can be detached individually from a corresponding one of the pulp supplying devices for effecting the cleaning work. At the same time, a spare molding device may be connected to the corresponding one of the pulp supplying devices. Therefore, shutdown of the apparatus can be avoided. Accordingly, the production speed will not be affected adversely.
2. Since the number of the molded pulpboard blanks is increased greatly, the production yield can be enhanced.
3. The molding devices can be provided individually with female and male molds of different patterns. As such, molded pulpboards of different patterns can be produced at the same time without the need to shut down the apparatus.

Claims

1. An apparatus for manufacturing molded pulp-

boards, comprising a conveyor (5) having upstream and downstream portions and two opposite sides each extending between said upstream and downstream portions;

a molding device (4) arranged movably adjacent to said upstream portion of said conveyor (5) and at least one further molding device (4) arranged movably adjacent to said opposite sides, each of said molding devices (4) having a movable seat (41), a tank (42) disposed on said movable seat (41), a female mold (43) disposed in said tank (42), a cantilever support (44) connected to said movable seat (41) in a vertically movable position above said tank (42), a male mold (45) mounted on said cantilever support (44), a first driving device (46) for moving said cantilever support (44) toward and away from said tank (42) in order to engage and disengage said female and male molds (43, 45), a pickup device (48) mounted on said cantilever support (44) and adapted to transfer a molded pulpboard blank (7) formed on said female mold (43) from said female mold (43) to said conveyor (5), and a pulp supplying device (47) connected detachably to said movable seat (41) and adapted to supply an aqueous pulp suspension to said tank (42); and

a drying device (6) disposed adjacent to said downstream portion of said conveyor (5) and adapted to dry the molded pulpboard blank (7) on said conveyor (5).

2. The apparatus for manufacturing molded pulpboards as claimed in Claim 1, **characterized in that** said pickup device (48) of each of said molding devices (4) includes a second driving device (481) for moving said male mold (45) to and back from said conveyor (5), and a vacuum pump (482) connected to said male mold (45) and adapted for attaching the molded pulpboard blank (7) to said male mold (45).
3. The apparatus for manufacturing molded pulpboards as claimed in Claim 1, **characterized in that** said movable seat (41) of each of said molding devices (4) has casters (412) provided thereon.

Patentansprüche

1. Vorrichtung zur Herstellung von Faserplatten aus geformter Pulpe mit einem Förderer (5) mit aufstromigen und abstromigen Abschnitten und zwei gegenüberliegenden Seiten, deren jede sich zwischen den aufstromigen und abstromigen Abschnitten erstreckt;
einer Formvorrichtung (4), die bewegbar neben dem aufstromigen Abschnitt des Förderers (5) angeordnet ist, und mindestens einer weiteren Formvorrichtung (4), die bewegbar neben den gegen-

überliegenden Seiten angeordnet ist, wobei jede der Formvorrichtungen (4) einen bewegbaren Sitz (41), einen Tank (42), der auf dem bewegbaren Sitz (41) angeordnet ist, eine Aufnahmeform (43), die in dem Tank (42) angeordnet ist, aufweist, einer Auslegerstütze (44), die mit dem bewegbaren Sitz (41) in einer vertikal bewegbaren Position über dem Tank (42) verbunden ist, einer Einsteckform (45), die auf der Auslegerstütze (44) angebracht ist, einer ersten Antriebsvorrichtung (46) für das Bewegen der Auslegerstütze (44) zu dem Tank (42) hin und von diesem fort, um die Aufnahme- und Einsteckformen (43, 45) in und außer Eingriff zu bringen, einer Aufnahmevorrichtung (48), die auf der Auslegerstütze (44) angebracht und geeignet ist, einen Faserplattenrohling (7) aus geformter Pulpe, der auf der Aufnahmeform (43) gebildet ist, von der Aufnahmeform (43) zu dem Förderer (5) zu überführen, und einer Pulpenzuführvorrichtung (47), die lösbar mit dem bewegbaren Sitz (41) verbunden und geeignet ist, eine wäßrige Pulpensuspension dem Tank (42) zuzuführen; und einer Trocknungsvorrichtung (6), die neben dem abstromigen Abschnitt des Förderers (5) angeordnet und geeignet ist, den Faserplattenrohling (7) aus geformter Pulpe auf dem Förderer (5) zu trocknen.

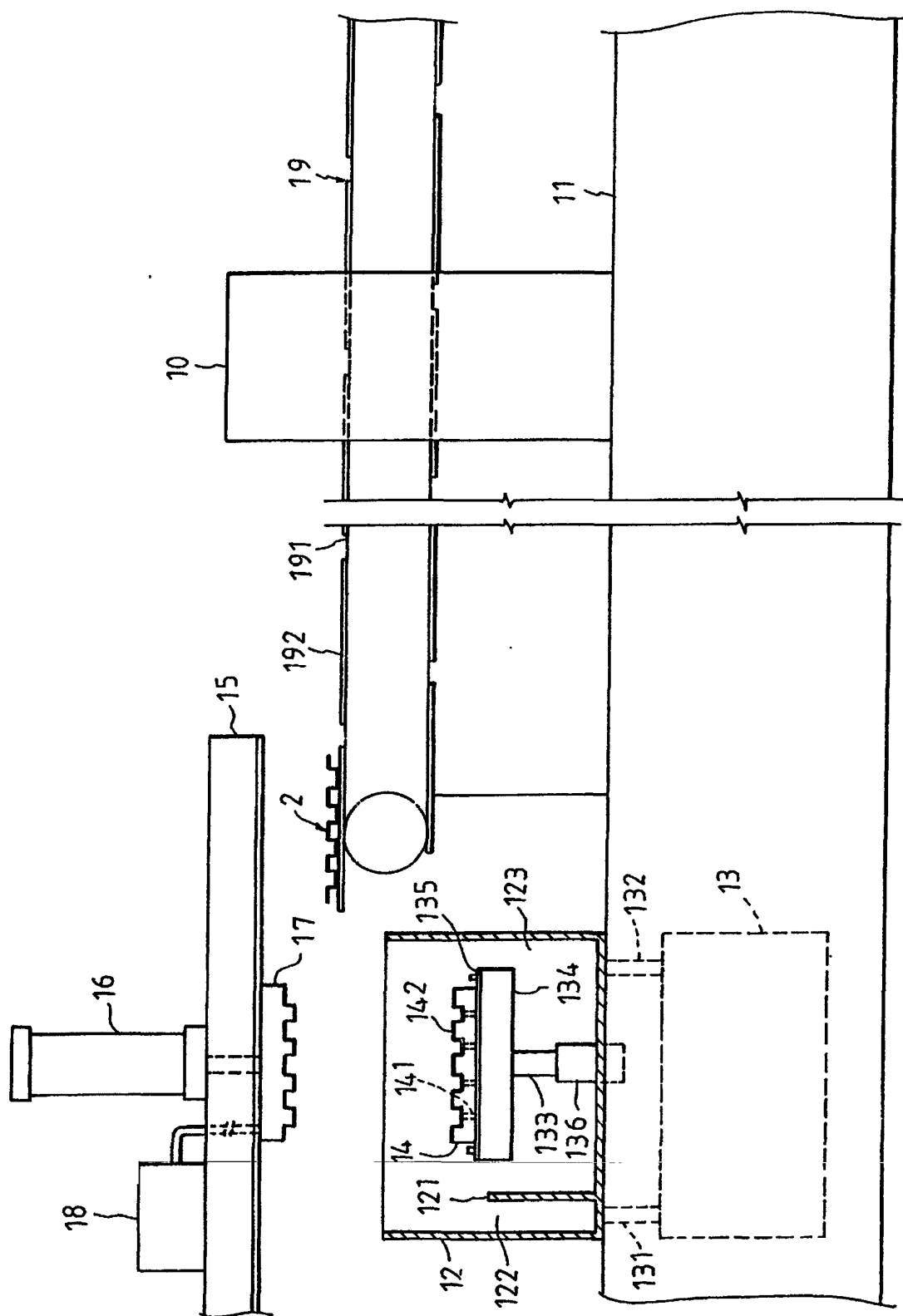
2. Vorrichtung zur Herstellung von Faserplatten aus geformter Pulpe nach Anspruch 1, **dadurch gekennzeichnet, daß** die Aufnahmevorrichtung (48) jeder der Formvorrichtungen (4) eine zweite Antriebsvorrichtung (481) aufweist für das Bewegen der Einsteckform (45) zu dem Förderer (5) und von diesem zurück, sowie eine Vakuumpumpe (483), die mit der Einsteckform (45) verbunden und geeignet ist für das Anbringen des Faserplattenrohlings (7) aus geformter Pulpe an der Einsteckform (45).
3. Vorrichtung zur Herstellung von Faserplatten aus geformter Pulpe nach Anspruch 1, **dadurch gekennzeichnet, daß** der bewegbare Sitz (41) jeder der Formvorrichtungen (4) an dieser vorgesehene Gleitrollen (412) aufweist.

Revendications

1. Appareil pour fabriquer des cartons de pâte moulés, comprenant un convoyeur (5) comportant des parties amont et aval et deux côtés opposés s'étendant chacun entre lesdites parties amont et aval ;
un dispositif (4) de moulage agencé de manière mobile adjacent à ladite partie amont dudit convoyeur (5), et au moins un dispositif (4) de moulage supplémentaire agencé de manière mobile adjacent auxdits côtés opposés, chacun desdits dispositifs (4) de moulage comportant un siège mobile

(41), un réservoir (42) disposé sur ledit siège mobile (41), un moule femelle (43) disposé dans ledit réservoir (42), un support en porte-à-faux (44) relié audit siège mobile (41) dans une position mobile verticalement au-dessus dudit réservoir (42), un moule mâle (45) monté sur ledit support en porte-à-faux (44), un premier dispositif (46) d'entraînement destiné à approcher ledit support en porte-à-faux (44) vers ledit réservoir (42) et à l'en écarter, afin d'engager et de dégager lesdits moules femelle et mâle (43, 45), un dispositif (48) de saisie monté sur ledit support en porte-à-faux (44) et apte à transférer une ébauche (7) de carton de pâte moulé formée sur ledit moule femelle (43) dudit moule femelle (43) vers ledit convoyeur (5), et un dispositif (47) de délivrance de pâte relié de manière amovible audit siège mobile (41) et apte à délivrer une suspension de pâte aqueuse audit réservoir (42) ; et un dispositif (6) de séchage disposé adjacent à ladite partie aval dudit convoyeur (5) et apte à sécher l'ébauche (7) de carton de pâte moulé sur ledit convoyeur (5).

2. Appareil pour fabriquer des cartons de pâte moulés selon la revendication 1, **caractérisé en ce que** ledit dispositif (48) de saisie de chacun desdits dispositifs (4) de moulage inclut un second dispositif (481) d'entraînement destiné à déplacer vers l'avant et vers l'arrière ledit moule mâle (45) par rapport audit convoyeur (5), et une pompe à vide (482) reliée audit moule mâle (45) et apte à accoupler ladite ébauche (7) de carton de pâte moulé et ledit moule mâle (45).
3. Appareil pour fabriquer des cartons de pâte moulés selon la revendication 1, **caractérisé en ce que** ledit siège mobile (41) de chacun desdits dispositifs (4) de moulage possède des roulettes (412).



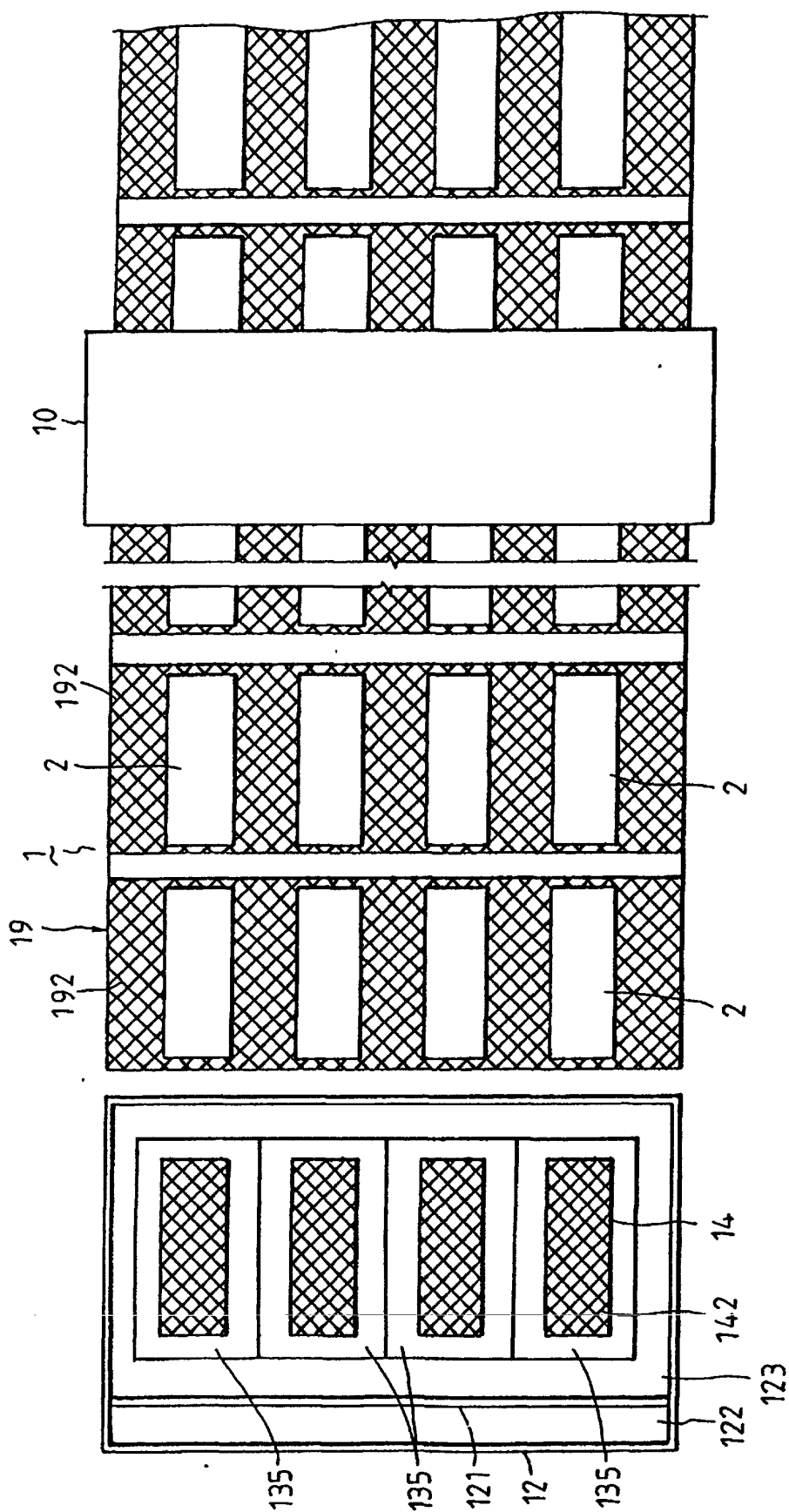


FIG. 2 PRIOR ART

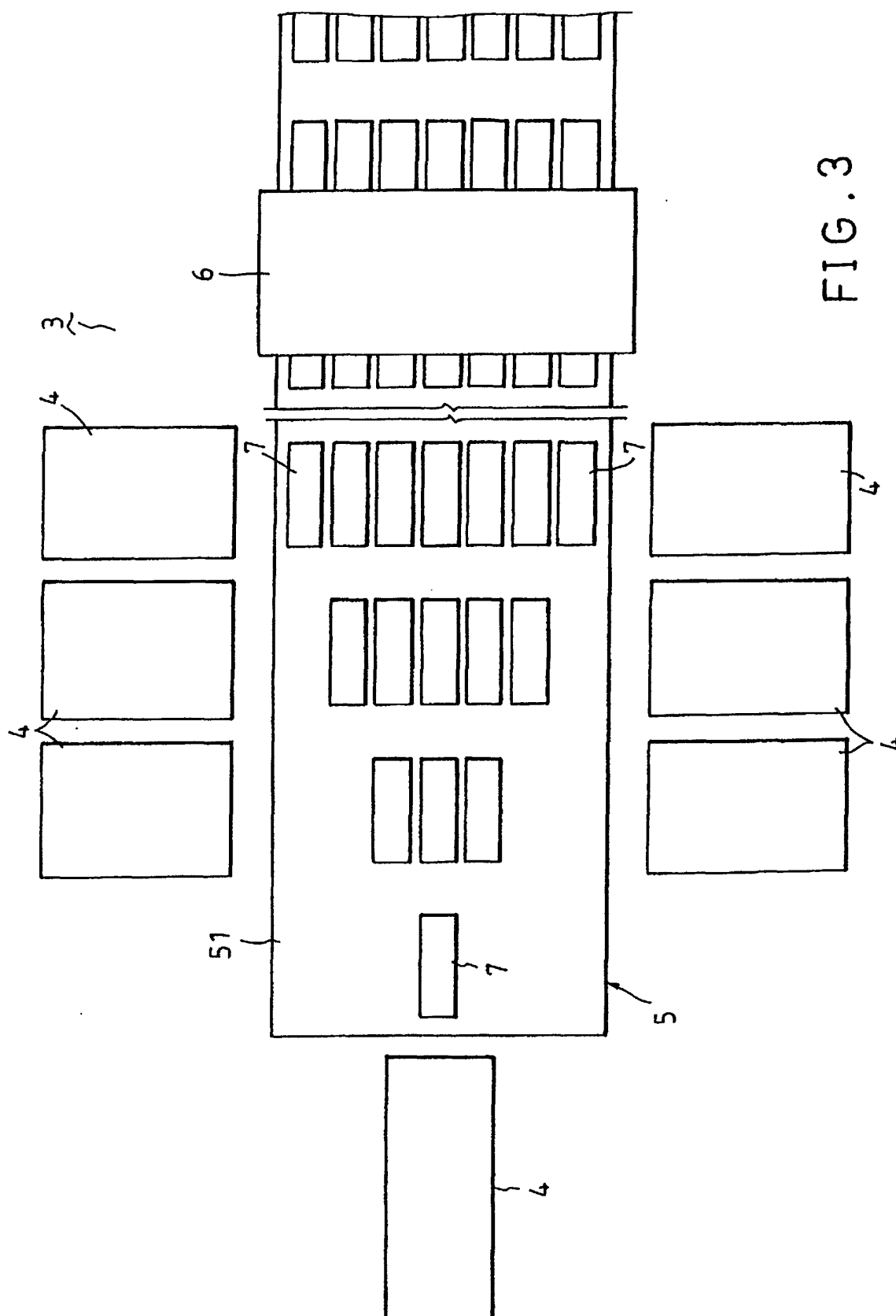
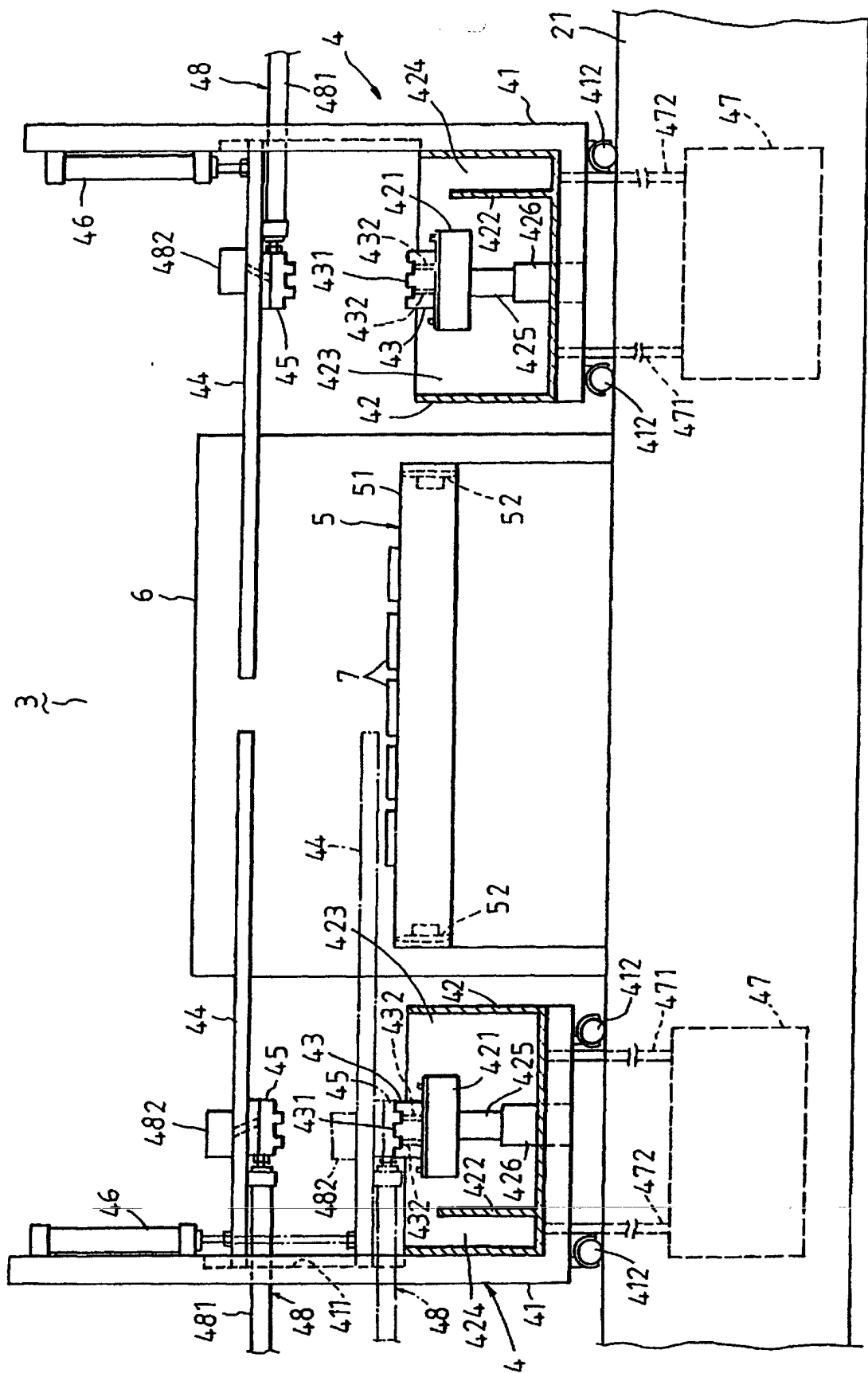


FIG. 3



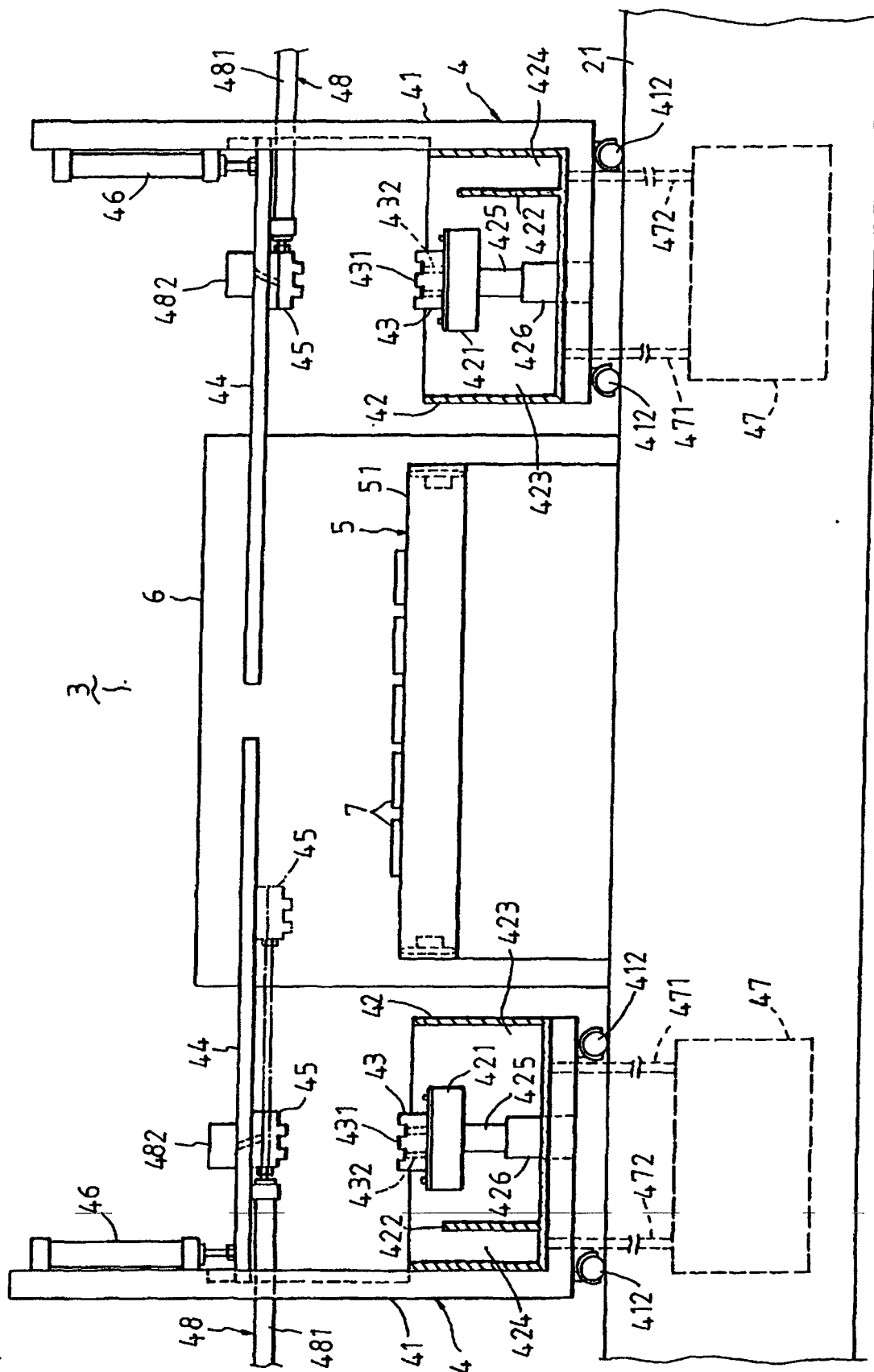


FIG. 5