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(54) **Improvements in or relating to kilns.**

(57) A kiln assembly includes a kiln having an entrance and an exit and means for moving cars loaded with ware to be fired from the entrance to the exit. At the exit (14) there is provided car receiving means (16) and at the entrance (10) car feed (12) means each of which are generally of the same construction and are linked by a conveyor (26) moving cars from the receiving to the feed means. The cars have a dimension in the direction of their travel through the kiln less than their transverse dimension and the receiving and feed means include arrangements for lifting the cars and turning them through 90° at each means so that as the cars move along the conveyor their greater dimension is arranged in the direction of travel.

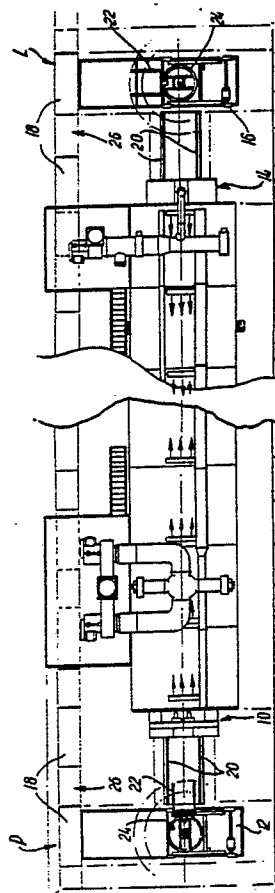


Fig. 1

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Improvements in or Relating to Kilns

The present invention concerns improvements in or relating to kiln assemblies, and especially but not exclusively to kilns for firing ceramic ware.

According to the present invention there is provided a kiln assembly including a plurality of cars adapted to carry ware to be fired through the kiln with the cars arranged such that their dimension transverse to the direction of movement through the kiln is greater than their dimension parallel to the kiln, receiving and feeding means, for respectively receiving cars exiting from the kiln and cars to be fed to the kiln, and conveyor means for moving cars between the receiving and feeding means said receiving means incorporating a car turning arrangement whereby after leaving the kiln and prior to re-introduction to the kiln each car is rotated through 90° such that as it travels from the receiving means to the feeding means its shortest dimension is transverse to the direction of travel through the kiln.

Preferably the kiln cars have wheels adapted to run on rails arranged in the kiln in the longitudinal direction of the kiln. Preferably the receiving and feeding means each have an elevating device for lifting and lowering kiln cars from and to the rails.

Preferably the feeding and receiving means are movable transversely to the direction of travel of cars through the kiln. Preferably the conveyor means is arranged alongside the kiln to transport cars deposited thereon by the receiving means to the feeding means, the cars being unloaded and loaded with ware while on the conveyor means.

Preferably the car comprises a base from the upper surface of which project a plurality of columns arranged in pairs, a support beam extending between the columns of each pair and a relatively thin ware supporting bat supported by three or more beams.

Preferably the columns comprise hollow tubes of refractory material terminating in enlarged caps having grooves therein to accommodate the beams. Where no caps are provided the column tops may be grooved to accommodate the beams.

A method of continuously cycling kiln cars through a kiln assembly comprising passing a car through a kiln, receiving the car on its discharge from the kiln, rotating it through 90°, conveying it to the entrance to the kiln and prior to re-introducing it into the kiln rotating it through 90°.

Preferably loading and unloading operations are carried out as the car is returned from the exit to the entrance of the kiln.

Preferably the car is lifted off a transportation arrangement on exit from the kiln and deposited on a return conveyor arrangement and is lifted from said conveyor arrangement and redeposited on the kiln transportation arrangement at the entrance to the kiln.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:-

Fig 1 is a partial plan of a kiln assembly; and

Fig 2 is a perspective view of a kiln car suitable for use in the kiln assembly.

Fig 1 shows only regions at the feed and delivery ends from a tunnel kiln.

At the entrance 10 to the kiln there is provided a kiln car feed means 12 while at the exit 14 from the kiln there is provided a kiln car receiving means 16.

The feed and delivery means are essentially of similar construction and the description of one of said means set out below should be regarded as being a description of the other means.

A plurality of wheeled kiln cars 18 (only some of which are shown in the drawings) are provided to carry ware through the kiln. The kiln cars travel through the kiln on their wheels and are conveyed from the inlet 10 to the outlet 14 of the kiln by any suitable known means on rails 20 extending through the kiln. The feed means 12 includes a structure 22 adapted to engage the underside of a kiln car 18 and elevate the car above the level at which its wheels 112 (Fig 2) would engage the rails 20. The structure 22 is mounted on a turntable 24 which, on operation, rotates the structure 22 with a kiln car thereon through 90°.

The feeding means 12 is itself mounted on rails whereby it may move from a position in which the centre of its turntable lies on the longitudinal centre axis of the kiln to a point laterally spaced from this axis where the structure 22 can engage a kiln car 18 brought loaded with ware to a pick-up station P by a conveyor 26 arranged alongside the kiln and running parallel to the rails 20 thereof.

In operation, a kiln car 18 brought by the conveyor 26 to the pick-up station P is lifted off the conveyor by the feed means 12 which is then traversed to the position shown in the drawing at which point the turntable assembly is operated to rotate the kiln car through 90° such that its shorter dimension lies along the line parallel to the rails 20. The structure 22 on which the kiln car is supported is then lowered to engage the kiln car's wheels on the rails 20. The car may then be progressed in any normal manner through the kiln so that the ware thereon is fired.

At the outlet from the kiln 14 the receiving means 16 which, as set out above is similar in construction and operation to the feed means 12, receives on its structure 22 a "fired" kiln car, raises the kiln car 18 clear of the rails 20, rotates this kiln car through 90° by means of its turntable assembly 24, moves transversely of the rails 20 and deposits the kiln car at a loading station L on the chain conveyor 26. The chain conveyor then moves the kiln car alongside the kiln from outlet to inlet and during this movement it can be readily unloaded and loaded manually by operatives or automatically by machinery, the loading and unloading operations being facilitated by the fact that the shortest dimension of the car, that is its fore-and-aft dimension as it passes through the kiln, is normal to the loading and unloading direction so that the ware when being loaded and unloaded has to be moved over a relatively short distance.

Various modifications can be made without departing from the scope of the invention, for example alternatively designed feed and receiving means may be employed provided that they receive a car in one orientation and rotate it through 90° before discharging it and the feed and receiving means may be arranged to serve more than one kiln whilst using one or more conveyors for the return transport system.

The means for transporting cars through the kiln may be amended, for example roller means may be employed. In another modification two or more cars of the type described above can be arranged alongside each other and passed side-by-side through the kiln. In such a situation modified feeding and receiving means would be called for.

In the embodiments and modifications described above the kiln is a tunnel kiln where firing is continuous as the cars make from the entrance to the exit of the kiln. The invention is equally applicable to a shuttle kiln where a batch of cars are fed to the kiln where they remain stationary while firing takes place. In a shuttle kiln assembly, according to the invention, cars are fed through the kiln entrance as before while the exit is closed until sufficient cars are accumulated in the kiln. Firing then takes place and after firing the kiln exit is opened to allow cars to move to the receiving means 16.

The present invention as described above with reference to Fig 1 obviates or mitigates problems associated with certain kilns.

Recent developments have been towards kilns which are much shorter in length but wider than kilns previously employed as it has been found that a design of this nature gives rise to considerable thermal and other efficiencies.

As the width of the kiln increases so also does the width of the kiln cars passing therethrough and this creates problems especially if the cars are loaded by hand or by certain automatic mechanised loading arrangements as, for example, a manual operator has only a limited reach and consequently cannot easily set ware to be fired on areas of the car out of his reach.

Fig 2 shows one type of kiln car which is suitable for use in a kiln of the type described with reference to Fig 1.

The kiln car is adapted to run on rails 20 by means of wheels 112 rotatably mounted on the underside of the chassis 108 of the car. The car is provided with a layer of refractory insulating material 114 through which passes a plurality of pairs of refractory columns in the form of tubes 118 each terminating in an enlarged diameter end cap 120 and being supported by the steel chassis 108 of the kiln car. A horizontal groove 122 is formed in the upper face of each end cap 120 so that a rectangular cross-section beam 124 may be received therein with the greatest cross-sectional dimension of the beam being arranged substantially vertically.

Each edge of the beam 124, at the appropriate location, is provided with notches 126 to mate with the notches 122 in the end caps 120 to firmly locate the beam against transverse displacement. As notches 126 are formed in each edge of the beam the beams may be reversed in use.

A plain or perforated bat 130 of a refractory material is supported on the beam and the spacing of the beams is so chosen that they take a major proportion of the weight of the ware on the bat so that the bat need not be particularly rigid and consequently can be of relatively light weight.

The bat may be formed from a plurality of rectangular sections.

Typically a bat thickness of 15mm may be employed as opposed to the thickness of 30 - 40mm now employed with conventional bat supporting means.

Various modifications can be made to kiln cars of the type illustrated in Fig 2, for example the construction of the kiln car can take any convenient form and the beams and the support columns can be arranged in any convenient manner. In a further modification, depending on the ware used, the bats 130 can be dispensed with and the ware can be supported directly on the beam tops. Furthermore, under certain circumstances the columns 118 may be notched to directly receive the beams 124 without the use of the caps 120.

Claims

1. A kiln assembly including a plurality of cars adapted to carry ware to be fired through the kiln characterized in that the cars (18) are arranged such that their dimension transverse to the direction of movement through the kiln is greater than their dimension parallel to the kiln, receiving and feeding means (16,12) for respectively receiving cars exiting from the kiln and cars to be fed to the kiln, and conveyor means (26) for moving cars between the receiving and feeding means, said receiving means (16) incorporating a car turning arrangement (24) whereby after leaving the kiln and prior to re-introduction to the kiln each car is rotated through 90° such that as it travels from the receiving means (16) to the feeding means (12) its shortest dimension is transverse to the direction of travel through the kiln.

2. A kiln assembly as claimed in Claim 1, characterized in that the receiving and feeding means (16,12) each have an elevating device for lifting and lowering kiln wheeled cars (18) from and to rails running through the kiln.

3. A kiln assembly as claimed in Claim 1 and Claim 2 characterized in that the feeding and receiving means (16,12) are movable transversely to the direction of travel of cars through the kiln.

4. A kiln assembly as claimed in any one of Claims 1 to 3, characterized in that the conveyor means (26) is arranged alongside the kiln to transport cars (18) deposited thereon by the receiving means (16) to the feeding means (12), the cars being unloaded and loaded with ware while on the conveyor means.

5. A kiln assembly as claimed in any one of the preceding Claims, characterized in that the car comprises a base (108) from the upper surface of which project a plurality of columns (118) arranged in pairs, a support beam (124) extending between the columns of each pair and a relatively thin ware supporting bat (130) supported by three or more beams.

6. A kiln assembly as claimed in Claim 5 characterized in that the columns (118) comprise hollow tubes of refractory material terminating in enlarged caps (120) having grooves (122) therein to accommodate the beams (124).

7. A method of continuously cycling kiln cars through a kiln assembly characterized in that it comprises passing a car (18) through a kiln, receiving the car on its discharge from the kiln exit (14), rotating it through 90°, conveying it to the entrance (10) to the kiln and prior to re-introducing it into the kiln rotating it through 90°.

8. A method as claimed in Claim 7, characterized in that loading and unloading operations are carried out as the car is returned from the exit to the entrance of the kiln.

9. A method as claimed in Claim 7 and Claim 8, characterized in that the car is lifted off a transportation arrangement on exit from the kiln and deposited on a return conveyor arrangement and is lifted from said conveyor arrangement and re-deposited on the kiln transportation arrangement at the entrance to the kiln.

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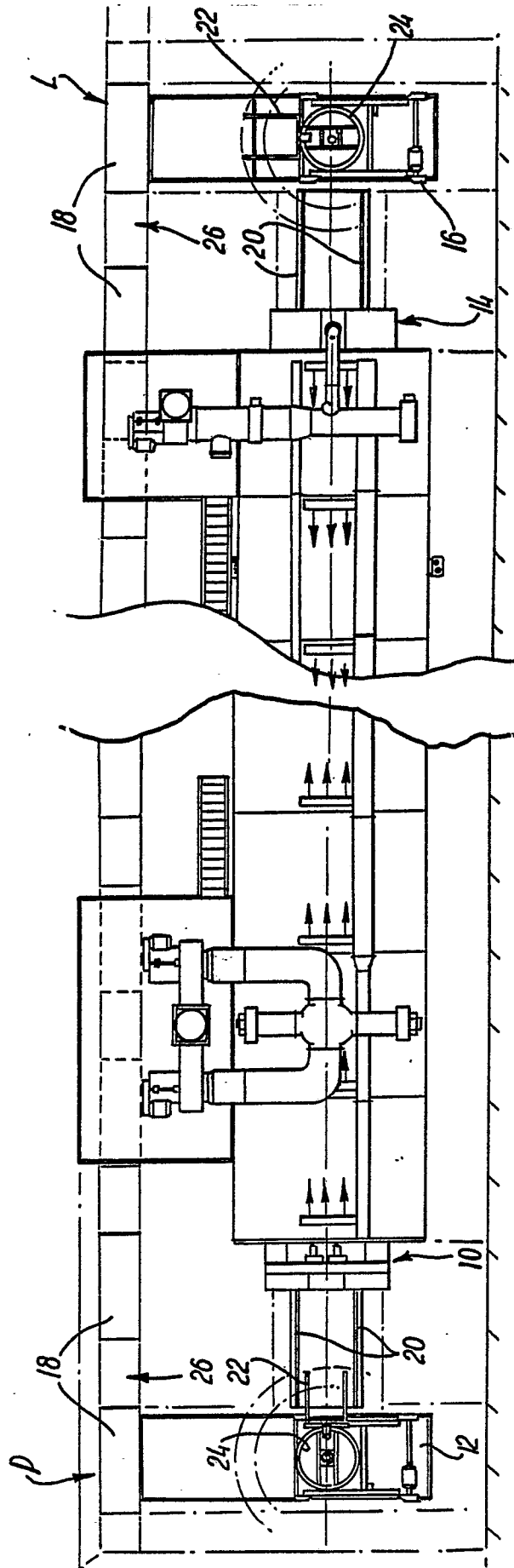
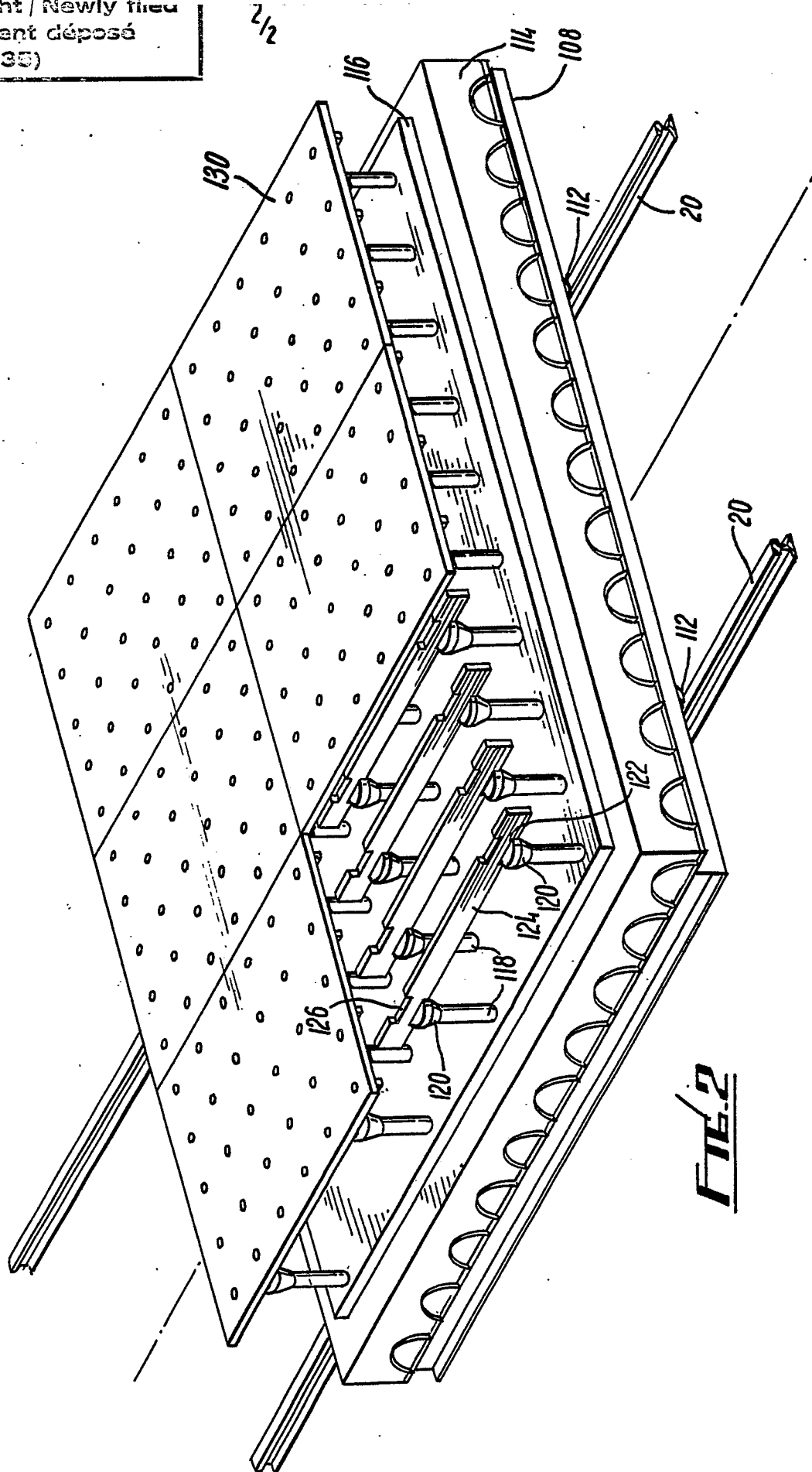


Fig. 1

Neu eingereicht / Newly filed
Nouvellement déposé
(R 35)



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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	FR-A-2 517 295 (SITI) * Claims; figures *	1,4,7-9	F 27 B 9/38 F 27 D 3/00
Y	GB-A-2 175 984 (HUTSCHENREUTHER AG) * Claims; figures *	1,4-9	
A	US-A-1 490 396 (P.A. MEEHAN) * Claims; figures *	1,4	
A	FR-A-2 124 832 (GIBBONS BROTHERS LTD) * Claims; figures *	4	
A	DE-A-2 939 437 (ANAWERK KERAMISCHE BETRIEBE) * Claims; figures *	5	TECHNICAL FIELDS SEARCHED (Int. Cl.4) F 27 B F 27 D
A	US-A-4 505 630 (W.C. KASCHNER) -----		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21-07-1987	Examiner COULOMB J.C.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			