

Jan. 13, 1970

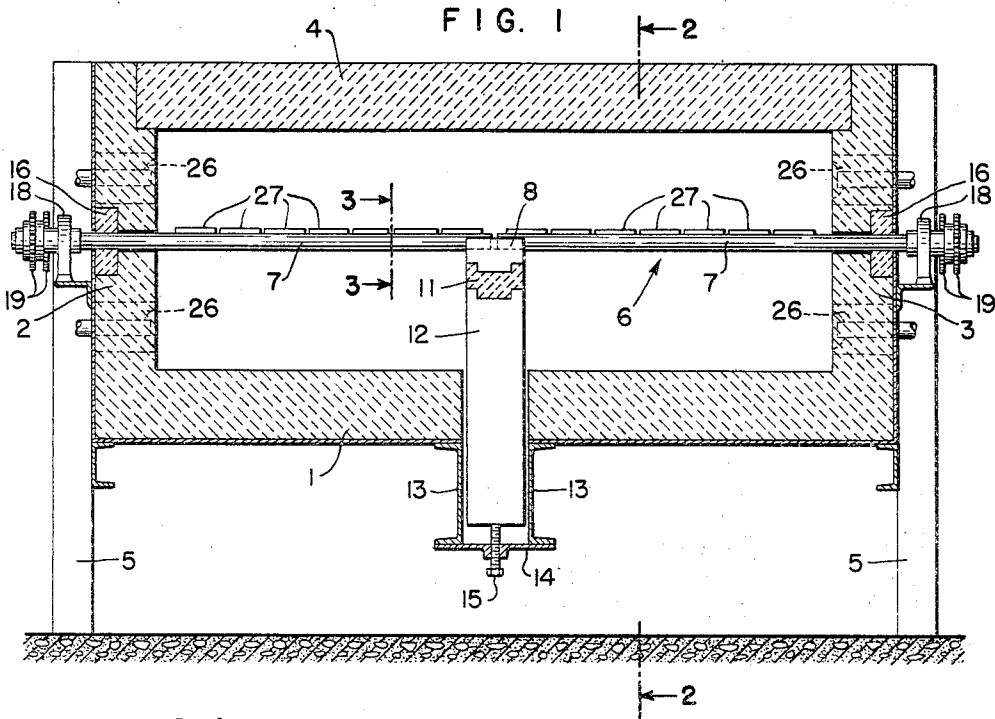
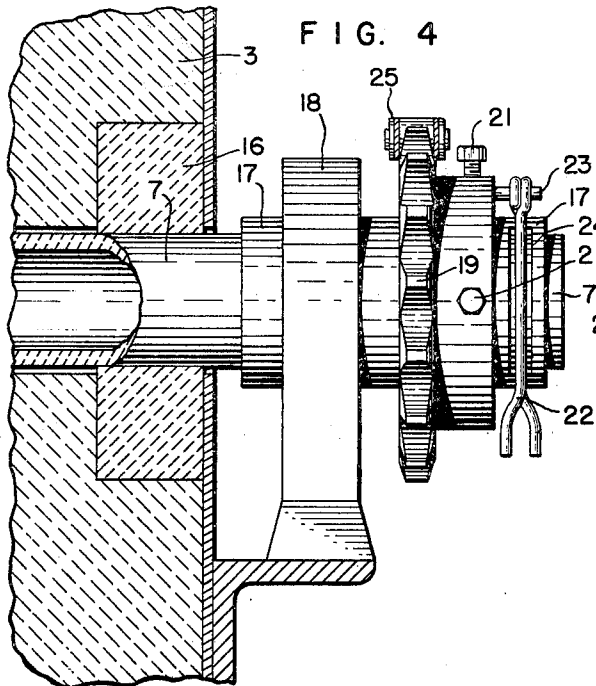
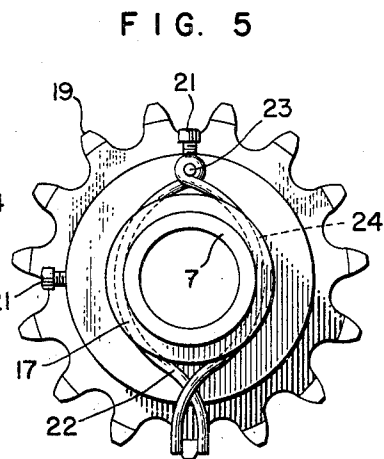
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3,489,397

ROLLER HEARTH KILN

Filed Feb. 9, 1968

2 Sheets-Sheet 1



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3,489,397

ROLLER HEARTH KILN

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Filed Feb. 9, 1968, Ser. No. 704,290
Int. Cl. F27b 9/24

U.S. Cl. 263—6

9 Claims

ABSTRACT OF THE DISCLOSURE

A kiln for firing ceramic ware having a roller hearth comprising a plurality of rollers extending from opposite sides through the walls of the kiln into the chamber. The inner ends of the rods are supported by bearing means in the chamber while their outer ends are frictionally driven from mechanism outside the kiln chamber.

The present invention relates to kilns for firing ceramic articles such as tiles, and more particularly to such a kiln using a roller hearth to move the work.

In conveying small pieces of ceramic ware, such as tiles, through a kiln it is customary to use rollers made of a refractory material. Because of the characteristics of this material, it has not been possible to use rollers of any great length. Consequently, the firing chamber of the kiln is relatively narrow, with a resultant small production capacity for a kiln of a given length.

It is an object of the present invention to provide a roller hearth kiln with a novel means of supporting and driving the conveyor rollers so that the width of a kiln chamber can be materially increased.

It is a further object of the invention to provide a frictional drive for the rollers of a roller hearth which may readily be disconnected to permit changing of the rollers, when necessary, without disturbing the normal operation of the kiln.

These and other objects can be obtained by providing axially aligned ceramic rollers extending across a kiln chamber. The inner, substantially abutting ends of the rollers are supported in a vertically adjustable bearing member. The outer ends extend through the walls of the kiln and are received in sleeves that are positively driven, with the sleeves being frictionally connected to the rolls.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a section across the kiln taken on line 1—1 of FIG. 2.

FIG. 2 is a view taken partially on line 2—2 of FIG. 1 and partially from outside the kiln.

FIG. 3 is a view showing the supports for the inner ends of the conveyor rods.

FIG. 4 is an enlarged view of the support and drive for the outer ends of the conveyor rolls; and

FIG. 5 is a view looking toward the end of FIG. 4 from the right.

The kiln includes a refractory structure built in accordance with ordinary kiln practice and including a floor 1, side walls 2 and 3, and a roof 4 to form an elongated kiln chamber. These parts are mounted on and reinforced by a suitable supporting structure 5. The chamber is divided into upper and lower sections by means of a conveyor mechanism 6 for moving work to be fired through the kiln.

The conveyor includes a plurality of rods 7 that are

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inserted from opposite sides, through openings provided in the side walls, toward the center of the chamber. The inner ends of these rods are supported by bearing blocks 8 each of which is provided with U-shaped slots or sockets 9 into which the ends of the rods are moved axially. It will be seen from FIG. 3 that the slots or sockets 9 are not as deep as the diameter of the rods 7 but that they do include slightly more than 180° of a circle. Bearing blocks 8 rest on a beam 11 which extends lengthwise of the kiln chamber through the center thereof. It will be noticed that the beam is slightly cupped on its upper surface to receive the bearing blocks and hold them in proper alignment. Beam 11 is supported at a plurality of points along its length by means of piers 12 which extend upwardly through suitable openings provided in the floor of the kiln. The space between the floor and the piers is normally filled with fibrous insulating material in order to prevent leakage of air into the kiln. The lower ends of the piers extend between a pair of channels 13 which are bridged by a plate 14. An adjusting bolt 15 is threaded into the plate under each pier to adjust the position of piers 12 so that beam 11 will be held accurately at the proper height even though the parts may have some relative movement due to expansion.

The outer ends of rods 7, which extend through the walls of the chamber, pass first through a block of close fitting insulating material 16 which may be fibrous and which serves to prevent inflow of air through the holes around the rods. Each of these rods is received in a sleeve 17 that is journaled for rotation in a bearing 18 suitably mounted on the framework of the structure. Each sleeve has a sprocket 16 encircling it with the sprockets being fastened to the sleeves by means of set screws 21 that are threaded into the holes of the sprocket hub. There is a frictional drive between each rod 7 and its sleeve 17 which comprises a substantially U-shaped spring 22 that is mounted on a pin 23 attached to the hub of sprocket 19. The legs of these springs are received in slots 24 formed on opposite sides of sleeve 17 so that the legs of the spring are in frictional engagement with the surface of the rods. If it is desired, small flats can be formed on the rods where they are engaged by the springs in order to give a more positive drive. It is intended that the rods be driven at the same speed as the sleeves but that there can be slippage between the rods and the sleeves, if necessary. Each of the sprockets is driven by a chain 25 at the speed necessary to move the work through the kiln while it is being fired. Burners 26 are shown in the side walls above and below the conveyor mechanism so that heat will be applied evenly to the top and bottom of ware 27, disclosed herein as being tiles.

The rods 7 are preferably made of a ceramic material which is capable of withstanding the heat of the kiln. In order to reduce their weight, they are usually, and are shown herein, as being in the form of ceramic tubes. Rods extending inwardly from opposite sides of the kiln are axially aligned with each other and the abutting ends of two rods are received in each of the sockets 9. These sockets are formed in bearing blocks 8 which are preferably made of a hard ceramic material with the surface of the slots being polished to reduce friction. The bearing blocks can be made as a continuous member, but are preferably made in segments, as shown, to prevent misalignment due to expansion. For firing relatively small tiles, the rods will be about 1" in diameter and will be placed on 2" centers. Since the rods are so close together the sprockets driving the sleeves will preferably be offset axially with respect to each other as shown on the right hand portion of FIG. 2. This means that there will be two parallel chains 25 on each side of the kiln in order to drive all of the rods. While the rods on each side are driven inde-

pendently, the drive for the four chains can come from a single source so that all of the rods will rotate at the same speed. The rods will normally rotate at from $3\frac{1}{2}$ to 4 revolutions per minute.

In the past it has been suggested that ceramic rods of the type disclosed herein should be used for forwarding ware through a kiln; but because of the brittle nature of these rods and their relatively small diameter, it has been necessary to make the kilns relatively narrow so that the rods can be supported on outboard bearings at both ends. With the present invention the manner of supporting and driving the rods permits the kiln to be considerably wider than is customary and thereby substantially increases the capacity of the kiln of a given length. In effect, separate groups of ware are being forwarded by the separate sets of rods. It is noted that if there is a jam-up in the kiln, as happens from time to time in spite of all precautions, the drive can continue but due to the springs 22 those rods affected can stay still until the jam has been cleared away. If perchance one of the rods is broken it can readily be removed and a new one inserted without stopping or cooling the kiln. It is only necessary to move the lower handlelike ends of a spring 22 together to relieve its frictional engagement on the end of the rod. The rod can then be removed axially and replaced in a matter of minutes. Broken tiles and portions of broken rods, if any should break, will fall to the bottom of the kiln and may be removed through suitable openings provided in the side walls.

While in accordance with the provisions of the Statutes I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. Conveyor mechanism for moving work to be fired through an elongated kiln having an elongated chamber with side walls including a plurality of rods extending in parallel relation through openings in a side wall into said chamber, means in said chamber to support one end of each of said rods for rotation, means outside said side wall to support the other end of and to rotate said rods, said last means including a tubular sleeve receiving each rod, a bearing supporting each sleeve for rotation, means to rotate said sleeves in unison, and a friction drive between each sleeve and the rods received therein.

2. The combination of claim 1 in which said friction drive includes spring means attached to each said sleeve and normally biased toward the axis of said sleeve through a slot formed in said sleeve substantially perpendicular to said axis, said spring means frictionally engaging the surface of a rod extending through said sleeve.

3. The combination of claim 1 in which said means to hold said one end of said rods includes a member extending lengthwise of said chamber, said member having a plurality of sockets formed therein into which said ends of said rods extend, and means to release said friction drives whereby said rods may be moved axially through said sleeves, across said chamber and into said socket.

4. The combination of claim 3 including means to adjust said member vertically thereby to align said sockets with said openings.

5. In a continuous kiln, structure forming an elongated chamber having side walls, a floor and a roof, means to move separate groups of ware to be fired through said chamber independently comprising a plurality of rods for supporting one group of ware extending through one of said side walls toward the center of said chamber, a plurality of rods for supporting another group of ware extending through the other side wall toward the center of said chamber, the rods extending through one side wall being axially aligned with the rods extending through the other wall, means extending lengthwise through the center of said chamber to support the inner ends of each of said plurality of rods for rotation, and separate means beyond said side walls to rotate each of said plurality of rods.

6. The combination of claim 5 in which said means extending lengthwise through said chamber includes a beam, and means on said beam having U-shaped slots formed therein, each of said slots receiving therein the ends of a pair of axially aligned rods.

7. The combination of claim 6 in which said beam is supported by a plurality of piers extending upwardly through said floor, and means to adjust individually each of said piers, thereby to align said rods properly.

8. The combination of claim 6 in which said U-shaped slots have a depth less than the diameter of said rods.

9. The combination of claim 5 in which said means to rotate each of said rods includes a sleeve to receive each rod beyond said side walls, means to mount each of said sleeves for rotation, a friction drive between each sleeve and the rod received therein, and means to rotate said sleeves in unison.

References Cited

UNITED STATES PATENTS

1,927,634	9/1933	Fahrenwald.
2,175,834	10/1939	Fatkin.
3,338,569	8/1967	Cuvelier.

JOHN J. CAMBY, Primary Examiner

U.S. Cl. X.R.

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