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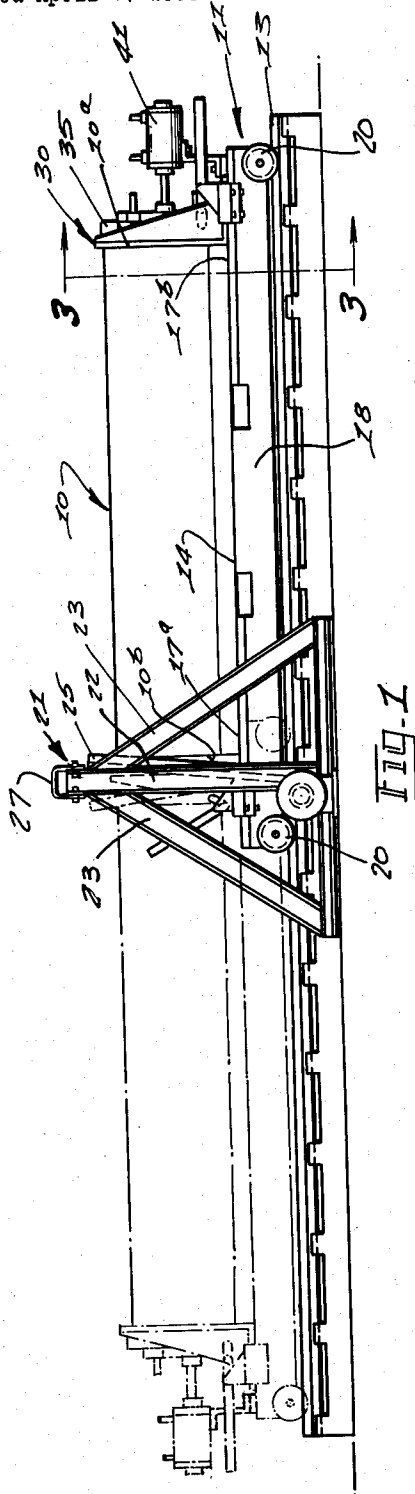
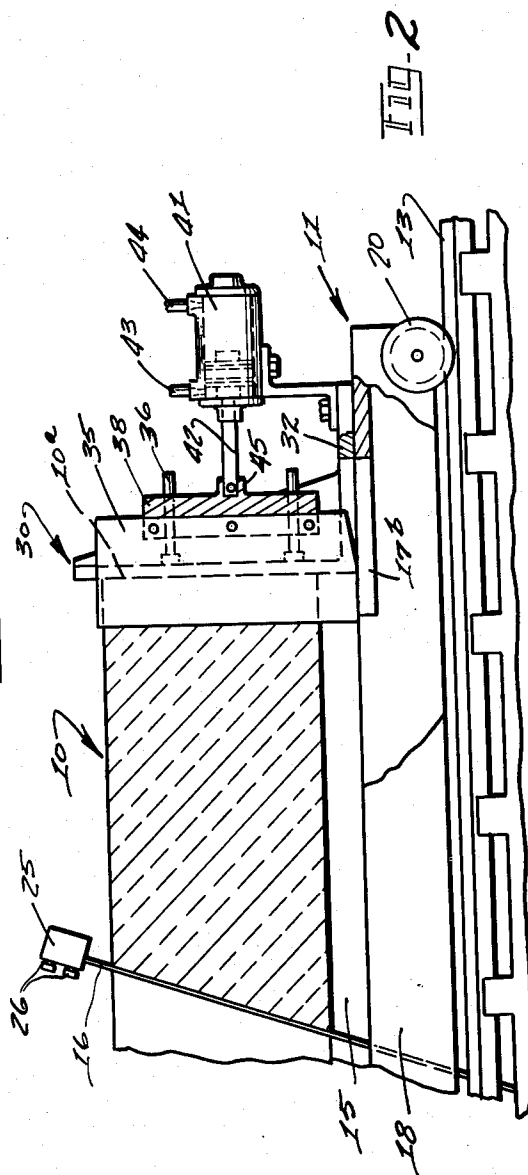
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APPARATUS FOR SLICING SEMI-HARDENED MATERIALS

Filed April 7, 1958

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

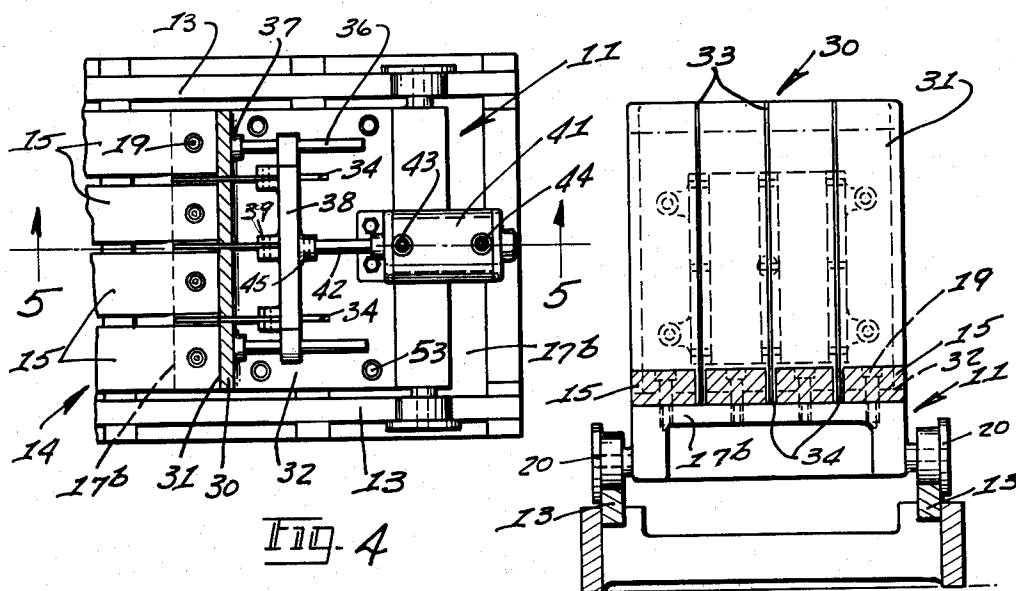


Fig. 4

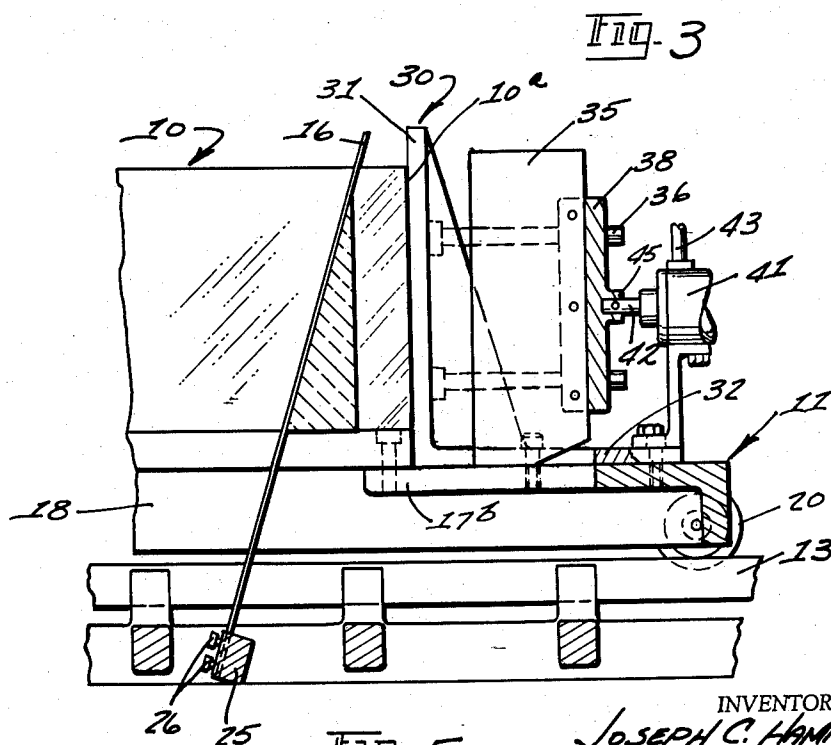


Fig-5

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APPARATUS FOR SLICING SEMI-HARDENED MATERIALS

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4 Claims. (Cl. 25—107)

This invention relates to an improved apparatus for slicing a mass of semi-hardened materials into sections.

Heretofore, it has been found advantageous in many instances to utilize pre-fabricated building materials such as, for example, pre-formed cement slabs, blocks, and the like for various structural purposes. According to methods and apparatus heretofore used in producing such pre-formed cementitious materials, it has been customary practice to partially react an aqueous slurry containing the desired proportions of the cementitious materials to a semi-hardened self-sustaining mass in molds, and subsequently to slice the semi-hardened molded cake into a plurality of slabs or blocks of the desired dimensions. Thereafter, the sliced semi-hardened sections are cured to impart strength and rigidity thereto sufficient for structural purposes.

It has further been found advantageous to employ cutting wires for the slicing operation. The cutting wires are held taut under tension and are passed through the molded cake and sever same into two or more slabs or blocks, in a manner similar to slicing cheese. However, as the cutting wire or wires complete the passage through the material, and are about to emerge therefrom, they tend to tear or break portions of material away from the trailing face of the cake. In common practice the trailing face of the molded cake is reinforced by backing up the cake with spaced bars having slots aligned with the path of movement of the cutting wires, so that the cutting wires may pass through the slots as they exit from the cake. However, this manner of reinforcing the trailing face of the molded cake has not been completely satisfactory, and, in many instances, it has been found necessary to mold the cake to a length several inches longer than is desired for the finished slab or block in order that the trailing end or face of the cake may subsequently be severed to eliminate defects and damage caused therein by material being torn away or broken out by the cutting wires.

Accordingly, it is an object of the present invention to provide an improved apparatus for slicing a semi-hardened mass of materials into sections.

Another object of the present invention is to provide an improved wire cutting apparatus for cutting a cake of semi-hardened material into sections which alleviates the formation and concentration of damaging shearing stresses in the vicinity of the trailing end or face of the cake of material as the cutting wires are passed therethrough and emerge from the cake.

A further object of the present invention is the provision of an improved apparatus for slicing a semi-hardened cake of molded material, which improvement is readily adaptable for use with earlier known wire cutting methods and apparatus.

The specific nature of this invention, as well as other objects and advantages thereof, will become apparent to those skilled in the art from the following detailed description, taken in conjunction with the annexed sheets of drawings on which, by way of example only, a preferred embodiment of this invention is illustrated.

In general, the apparatus embodied in the present invention overcomes the above-mentioned disadvantages incurred in slicing semi-hardened cakes of cementitious materials with tensioned cutting wires. According to the present invention, the trailing face of the molded cake

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of semi-hardened material is pre-slit prior to the emergence of the cutting wires therefrom. This pre-slitting operation is accomplished by the provision of movable cutting elements or blades positioned adjacent to the trailing face of the molded cake which, when extended, penetrate the trailing face of the molded cake and when retracted leave an incision in the material registering with the line of cut of the cutting wires. Thus, the cutting blades form slits preferably several inches in depth in the trailing face of the cake which the cutting wires enter as they emerge from the molded cake. As a result, the force of the cutting wires acting against the moving cake of material is reduced or eliminated as the cutting wires approach the trailing face of the material. Hence, the pre-slitting operation effectively avoids the formation and concentration of damaging stresses localized in the vicinity of the trailing face of the cake of material, and thereby eliminates the tendency of portions of the material to tear or break away from the trailing face of the cake as the cutting wires emerge therefrom.

Referring to the accompanying drawings:

FIG. 1 is a schematic side elevational view illustrating the molded cake of cementitious material positioned on the movable bed of a wire cutting machine with which the present invention is adapted to cooperate;

FIG. 2 is an enlarged centrally sectioned fragmentary view in side elevation of the cutting machine and illustrating the movable cutting blades of the present invention in an extended position;

FIG. 3 is a vertical sectional view taken substantially along the plane 3—3 of FIG. 1, the molded cake of cementitious material being omitted from the drawing for purposes of clarity;

FIG. 4 is a partly sectional fragmentary plan view of the trailing end of the cutting machine with the molded cake omitted, and further illustrating the cutting blades; and

FIG. 5 is an enlarged view, similar to FIG. 2 and taken along the plane 5—5 of FIG. 4, but illustrating the cutting machine nearing the completion of the slicing or cutting operation and showing the cutting blades in a retracted position.

In more specific detail, and as described with greater particularly in the co-pending patent application of Joseph L. Mennitt, Serial No. 619,319, filed October 30, 1956, and assigned to the assignee of the present application, the cementitious material is initially prepared from an aqueous slurry of reactive cementitious materials and molded into a semi-hardened cake of material in a mold usually having separable side and bottom members. After the slurry of cementitious materials have reacted sufficiently within the mold to attain a semi-hardened condition they are removed from the mold in the form of a self-supporting molded cake 10 and placed on the bed of the cutting machine 11.

Generally, and as more fully described in the aforementioned co-pending application of J. L. Mennitt, the cutting machine 11 includes a bed portion 14, which is constructed to move horizontally back and forth on tracks 13 between alternative positions, respectively indicated by the solid and broken lines in FIG. 1, and on which the cake of molded semi-hardened material is carried. The bed portion 14 includes a plurality of parallel ribs 15, best shown in FIGS. 3 and 4, which are spaced apart horizontally to provide slots extending lengthwise of the bed portion 14 and which accommodate stationary upright cutting wires 16. The opposite ends of the ribs 15 are supported on horizontal platforms 17^a and 17^b located at opposite ends of the bed portion 14, and which in turn are affixed to the frame 18 of the cutting machine 11. Bolts 19, or other suitable fastening means, secure the ribs 15 to the platform 17^a and 17^b to maintain proper

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registry between the cutting wires 16 and the slots defined between the ribs 15.

The horizontal movement of the bed portion 14 of the cutting machine 11 is effected by the provision of wheels 20, which run on the tracks 13 and carry the frame 18 of the machine and which may be positively driven by a rack and pinion type drive mechanism or other suitable drive mechanism, not illustrated, but fully described in said co-pending application.

During the horizontal travel of the bed 14 from the one alternative position to the other, the molded cake 10 is sliced into two or more individual sections by the stationary cutting wires 16, which are centered between the alternative positions of the bed. The mounting arrangement of the cutting wires 16 includes a U-shaped supporting frame 21 having stationary leg members 22 mounted at the outer sides of the tracks 13 and rigidly reinforced by diagonal struts 23. A secondary hollow frame 25, through the center of which the molded cake passes as it moves with the bed 14, carries the cutting wires 16 and tautly stretches same transversely across the path of movement of the molded cake 10 so that the cutting wires oppose the horizontal movement of the cake and slice same into sections. The individual horizontal spacing of the cutting wires 16 is such that the wires coincide with the slots defined between the ribs 15. Turnbuckles 26 provided on the frame 25 are attached to the cutting wires 16 and permit adjustment of the tension in the wires. Additionally, as shown by the solid and broken lines in FIG. 1, the frame 25 is fastened to the supporting frame 21 through pivots 27, which permit the frame 25 and the cutting wires 16 to be shifted to an inclined position during the beginning and ending of the cutting operation, respectively, to distribute the cutting forces into horizontal and vertical components, and thereby reduce the tendency of the cutting wires 16 to tear the semi-hardened material as the wires begin to enter or emerge from the cake 10.

Opposing the cutting forces applied to the molded cake 10 by the cutting wires 16, there is a backup plate 30, best illustrated in FIG. 3, which abuts the trailing face 10^a of the cake 10 and provides reinforcement thereto against movement or slippage of the molded cake and, to some extent, protects against damage by reason of break out or tearing away of portions of material from the trailing face of the cake, the trailing face being the end surface of the cake from which the cutting wires emerge upon completion of the cut. The backup plate 30 is constructed as an L-shaped structure and includes a vertical face 31 which abuts the trailing face 10^a of the molded cake 10 and a horizontal base 32 which is anchored to the platform 17^b by bolts 53 or other suitable fastening means. The vertical face 31 and the horizontal base 32 of the backup plate 30 are respectively formed with interconnected horizontal and vertical slots 33 and 34 located in the same vertical plane and together forming a series of L-shaped slots registering with the slots defined between the ribs 15. Thus, the cutting wires 16 may pass into the slots 33 and 34 upon emergence from the cake 10 and thereby facilitate unobstructed removal of the sliced sections of the cake from the bed 14 of the cutting machine.

The foregoing constitutes a general description of the wire cutting machine which is more fully disclosed in the co-pending patent application of J. L. Mennitt previously referred to.

In accordance with the improved apparatus forming the basis of the present invention, a slitting mechanism is provided which forms an incision in the trailing face 10^a of the molded cake 10 along the line of cut of each cutting wire 16. The slitting mechanism comprises a gang of cutting elements, such as the plurality of vertical cutting blades 35, three such blades being shown in FIG. 4, which have substantially the same thickness as the cutting wires 16, and which are mounted for horizontal

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reciprocating movement through the slots 33 and 34 in the backup plate 30, between alternate extended and retracted positions, respectively illustrated in FIGS. 2 and 4. The slitting mechanism further includes horizontal spindles 36 stationarily mounted at their inner ends in hubs 37 fixed to the back side of the vertical face 31 of the backup plate 30, and blade carrier 38 slidably journaled on the spindles 36 for horizontal movement. The blade carrier 38 includes horizontally spaced hubs 39 respectively having grooves formed therein to receive the back edges of the cutting elements or cutting blades 35 in tongue and groove relationship. Pins 40, or other suitable fasteners, maintain the cutting blades 35 in fixed position within the grooves in hubs 39. Reversible horizontal movement is imparted to the blade carrier 38 by a hydraulic cylinder 41, which drives a piston rod 42 axially journaled into a central hub 45 located on the back side of the blade carrier. The hydraulic cylinder 41 is actuated in conventional manner by fluid pressure which is supplied and exhausted through conduits 43 and 44 (FIG. 4). The actuation of the hydraulic cylinder 41 is regulated by conventional hydraulic control valves, not illustrated, to coordinate the reciprocating movements of the piston rod 42 and consequently the cutting blades 35 with the movement of the bed 14 of the cutting machine 11 in such manner that the cutting blades are extended and retracted prior to the emergence of the cutting wires 16 from the trailing face 10^a of the cake 10.

The method of operation of the foregoing apparatus is as follows:

As the cutting machine 11 with the molded cake 10 of semi-hardened material thereon is moved along the track 13, the cutting wires 16 enter the leading face 10^b of the material and begin to slice the cake 10 lengthwise into individual sections or slabs. However, prior to the emergence of the cutting wires 16 from the trailing face 10^a of the cake 10, and as shown in FIG. 2, the cutting blades 35 are extended by the forward stroke of the hydraulically actuated piston rod 42 and slit the trailing face of the cake to produce a plurality of vertical slits or incisions therein, which are respectively aligned with the line of cut of the cutting wires 16. The slits formed by the cutting blades 35 are preferably at least 2 to 3 inches deep, but may be varied in depth somewhat depending upon the consistency of the cake 10, the rate of travel of the cutting machine 11 and the cutting force consequently applied to the cake of material by cutting wires 16. As the cutting wires 16 proceed lengthwise through the cake of material 10, the cutting blades 35 are retracted by the rearward stroke of the hydraulic cylinder 41 and piston rod 12 to a position, substantially as shown in FIG. 5, withdrawn from the cake 10. The cutting wires 16 upon nearing the trailing face 10^a of the cake 10 enter the slits formed by the cutting blades 35 and pass easily through the trailing face 10^a of the material without imparting any appreciable cutting force thereto. Thus, the tendency of the material to break away from the trailing face 10^a of the material is effectively eliminated by virtue of the substantial reduction or elimination of the cutting force in the vicinity of the trailing face of the cake 10. After the cutting wires 16 emerge from the trailing face 10^a of the cake they enter the slots 33 and 34 in the backup plate 30. The movement of the cutting machine 11 is then terminated and the sliced sections, slabs or blocks are removed from the bed 14 of the cutting machine.

As indicated by solid and broken lines in FIG. 1 a slitting mechanism, such as just described, may be positioned at each respective end of the bed 14 of the cutting machine 11 so that the cutting and slitting operations may be performed during movement of the bed from either respective alternate position to the other.

By virtue of the above description, it is readily ap-

parent that the method and apparatus herein described substantially alleviate or avoid damage to the trailing face of the cake of molded material in a relatively simple and expedient manner. Further, the apparatus of the present invention is readily adaptable for use with wire cutting methods and apparatus presently utilized, such as, for example, described in the aforementioned co-pending patent application of J. L. Mennitt. Also it will be recognized that due to the elimination of the breakage or chipping of portions of the trailing face of the cake of semi-hardened material during the wire cutting operation considerable savings in the cost of operation are obtainable, since the material need not be further trimmed, and, since the waste resulting from such trimming operations may be substantially reduced or eliminated.

It will, of course, be understood that various details of construction may be modified through a wide range without departing from the principles of this invention, and it is not, therefore, the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim:

1. In a machine for cutting a cake of semi-hardened material into sections including a bed for supporting said cake, means for mounting the bed for horizontal travel, means for driving the bed, a gang of cutters mounted in parallel spaced relation and positioned in the path of said cake of material on said bed and operable to sever the cake into sections during the travel of the bed, the improvement comprising a gang of cutting elements shiftably mounted on said bed adjacent to the trailing end of said cake for cake penetrating movement in a path coinciding with the path of cut of said cutters, and means for actuating said cutting elements in reverse directions respectively to penetrate and withdraw from the trailing end of said cake to pre-slice said trailing end in advance of the travel of said cutters through said trailing end.

2. In a machine for cutting a cake of molded material into sections having a movable bed operable to carry said cake in a horizontal path of travel and a gang of cutting filaments disposed transversely of the path of travel of said cake to cut the latter into sections when said bed is moved, the improvement comprising a carrier mounted for reciprocating movement on said bed carrying a gang of cutting edges of adjacent the trailing end of said cake and disposed in coinciding alignment with the lines of cut of said cutting filaments, carrier actuating means operable to reciprocate said carrier relative to the trailing end of said cake and direct said

cutting edges into and out of the trailing end of said cake prior to completion of the cutting action of said cutting filaments, whereby said cutting edges form slits in the trailing end of said cake through which said cutting filaments are withdrawn from said cake.

3. In a machine for cutting a cake of molded material into sections having a movable bed operable to carry said cake in a horizontal path of travel and a gang of cutting filaments disposed transversely of the path of travel of said cake to cut the latter into sections when said bed is moved, the improvement comprising a carrier mounted for reciprocating movement on said bed and carrying a gang of cutting edges adjacent the trailing end of said cake, said carrier being operable in response to hydraulic actuating means operable in timed relation with the movement of said bed to reciprocate said cutting edges into and out of the trailing end of said cake in a path coinciding with the line of cut of said cutting filaments, whereby said cutting edges form slits in the trailing end of said cake through which said cutting filaments are withdrawn from said cake.

4. In a machine for cutting a cake of molded material into sections having a movable bed operable to carry said cake in a horizontal path of travel and a cutting filament disposed transversely of the path of travel of said cake to cut the latter into sections when said bed is moved, the improvement comprising a carrier mounted for reciprocating movement on said bed carrying a cutting edge adjacent the trailing end of said cake, said carrier being operable to reciprocate said cutting edge into and out of the trailing end of said cake in a path coinciding with the line of cut of said cutting filament and prior to completion of the cutting action of said cutting filament, whereby said cutting edge forms a slit in the trailing end of said cake through which said cutting filament is withdrawn from said cake.

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