Feb. 5, 1935. H. F. YOUNG 1,990,156

REENFORCED CONCRETE JOIST

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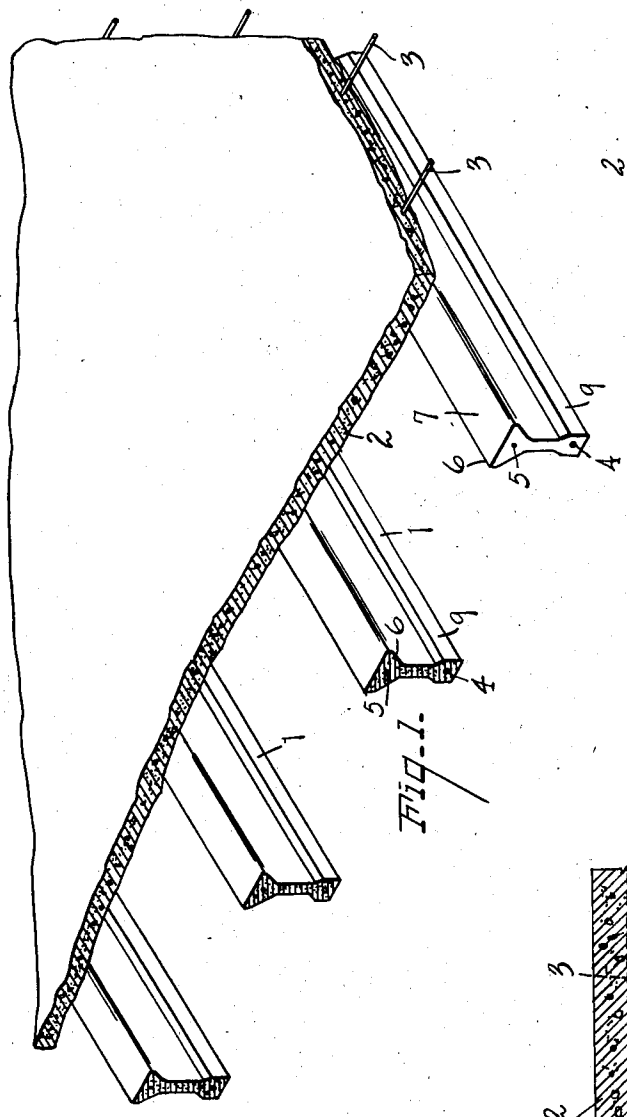


Fig. 1.

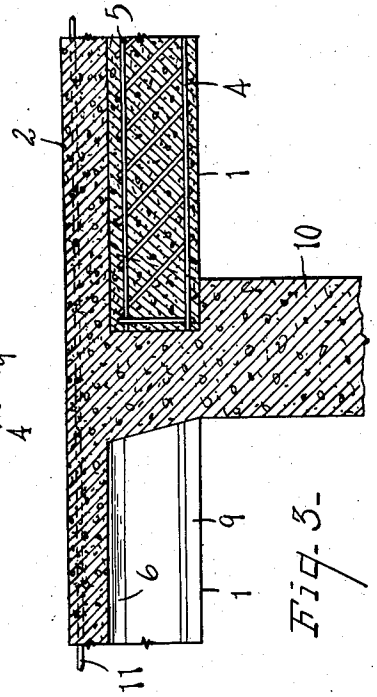


Fig. 3.

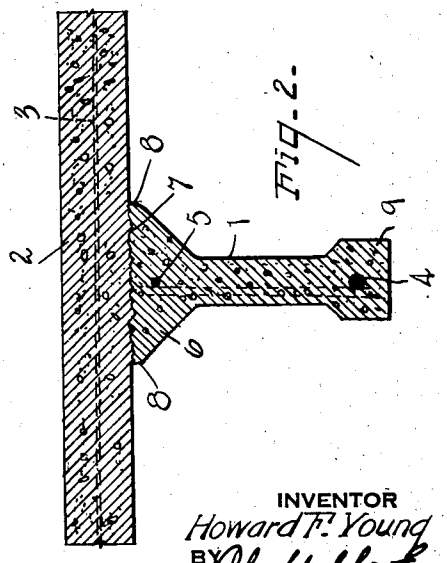


Fig. 2.

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## REENFORCED CONCRETE JOIST

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4 Claims. (Cl. 72—71)

The objects of this invention are:

First, to provide a precast reenforced concrete joist for use in floor or roof construction which joist may be joined to the floor or roof slab with a cement-to-cement bond to form a T beam construction in which the slab forms the principal compression member without depending upon any other bonding.

Second, to provide such a joist designed with a head of a shape and size to join to the slab with only a cement-to-cement bond.

Third, to provide such a joist that may be used in simple spans or in constructions embodying cantilever action over beams or wall supports.

Fourth, to provide such a joist that may be joined to the floor slab with only a cement-to-cement bond without the necessity of embracing the head of the joist in the slab by providing a flat top area of sufficient size to bond to and withstand the shear stresses normally placed on the construction by T beam action.

Objects relating to details and economies of my invention will appear from the description to follow. The invention is defined and pointed out in the claims. A structure which is a preferred embodiment of my invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a perspective view of a construction embodying my joists.

Fig. 2 is a sectional view of a slab poured on forms and joined to one of my joists.

Fig. 3 is a sectional view of a floor slab cast on my joists and embodying cantilever action or continuity.

Referring to the drawing, 1 is my reenforced concrete precast joist. 2 is a structural floor slab of reenforced concrete having reenforcing rods 3 and joined to the joists to give T beam action. The joists 1 have reenforcing rods 4 and 5 and may be formed of any concrete mixture. I have found that the use of the so-called light weight aggregates, such as cinders or "Haydite", which is a ground slag aggregate, are of great utility because of the light weight and the ability to absorb the bonding cement to form a very complete bond to the slab. With my construction, the joists may be made of such strength that the joists alone will not support the designed floor load until the slab is joined thereto to form the compression member. This makes possible the use of much lighter joists with a resulting saving in material. It will be understood that the joists can be made strong enough to support the load if it is so desired.

My joist is provided with a flaring head 6 having a substantially flat upper portion 7 on which the floor slab is received. The head at the edges of this surface 7 has substantially right angle portions 8 to allow close fitting of the form used in constructing a poured slab thereon. The flat portion 7 is somewhat larger than the base 9 of the joist although this is unnecessary, the object being merely to make a flat top area on the head of the joist of sufficient area to join to the slab with a cement-to-cement bond without other reenforcing means, such as projecting metal shear members. The base of my joist is smaller because it is designed to have merely the proper cross section and any excess would be waste.

In pouring a slab on forms, the forms are fitted between the joists and supported by suitable stirrups or shoring and the rods 3 are laid and the slab 2 is poured. The wet concrete bonds to the flat top 7 of the joists, making a cement-to-cement bond between the joist and the slab, forming a substantial monolith in which the joist forms the tension member and the slab the principal compression member.

The floor slab is united to the joist by a cement-to-cement bond and gives complete T-beam action, the slab acting as the principal compression member in the completed construction. The joist can be easily made in upright forms and when thus formed the surface 7 is rough and assists materially in the bonding.

In Fig. 3 I show my precast joists used in a floor construction over a girder support 10 with a rod 11 cast in the slab and substantially parallel to the joists and extending over the beam to provide cantilever action or continuity. In the construction shown, the ends of the joists are cast in the girder to form a monolithic construction. It will be understood that my construction can also be used over an interior bearing wall in which the ends of the joists are firmly embedded in masonry. The surface 7 on the head of the joist is of sufficient size to resist the added shear action incident to the cantilever action. It will be seen that in this construction the slab forms the principal compression member in the area of positive movement and is in tension in the area of negative movement adjacent the support.

In an 8.6 joist, which is a joist having an 8-inch depth and a .6-inch cross sectional steel reenforcement, I use a flat surface 7 that is five inches in width and find that such a joist is suitable for all types of construction work in which such a joist could be used. In a 12-foot length, which is substantially the shortest length used and in which the shear is the greatest, this joist at 24

inches spacing will support a 240-pound load to the square foot of floor. Of this 240-pound load, 40 pounds is dead weight and 200 pounds is live weight. A cantilever construction can be used with this joist at this length and load. In figuring this load, a safety factor of four, which is ordinarily used in reenforced concrete construction, allows a design calling for 100 pounds per square inch shear value, on the cement-to-cement bond between the joists and the slab. In a 12-foot joist of this size the shear averages 167 pounds to the linear inch and is of a maximum value of 333 pounds per linear inch. In a cantilever construction a 50 per cent increase shows 500 pounds per linear inch shear value. With these figures, the design allowing 100 pounds per square inch shear will require a 5-inch head on the joist.

It will be obvious to those skilled in the art that for different loads and different span or depth of joist, different shear values are easily computed and that the size of the head to which the slab is cemented with a cement-to-cement bond may be easily determined.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a floor construction or the like, a plurality of precast reenforced concrete joists, each having a head having a substantial flat bearing area adapted to receive a structural reenforced concrete slab to form a T beam construction, said area being of a size to bond to said slab with only a cement-to-cement bond of a strength to resist the shear stresses between the joists and the slab incident to T beam construction in which the slab is the principal compression member, and a structural reenforced concrete slab on said bearing areas of joists and joined to said bearing area with a cement-to-cement bond, without metallic reenforcing or bonding members extending from said joists and penetrating the joint between said joists and said slab to form a monolithic T beam construction in which the slab forms the principal compression member.

2. In a floor construction or the like, a plurality of precast reenforced concrete joists, each having a head having a substantial bearing area adapted to receive a structural reenforced concrete slab to form a T beam construction and having an area of a size to bond to said slab with only a cement-to-cement bond of a strength to resist the shear stresses between the joists and the slab incident to T beam construction in which the slab forms the principal compression member, and a structural reenforced concrete slab on said joists joined to said bearing area thereof with a cement-to-cement bond, without metallic reenforcing or bonding members extending from said joists and penetrating the joint between said joists and said slab to form a monolithic T beam construction in which the slab forms the principal compression member.

3. A precast reenforced concrete joist having a head with a substantial flat bearing area without projecting metal reenforcing or bonding means and adapted to receive a slab to form a T beam construction, said area being of a size to bond to a structural reenforced concrete slab bearing thereon with a cement-to-cement bond of a strength to resist shear stresses, without projecting metal, at the point of bonding incident to the use of said joist in T beam construction in which the slab forms the principal compression member.

4. A precast reenforced concrete joist having a head without projecting metal reenforcing or bonding means and with a substantial bearing area adapted to receive a slab, said area being of a size to bond to a structural reenforced concrete slab bearing thereon with a cement-to-cement bond of a strength to resist shear stresses, without projecting metal, at the point of bonding incident to the use of said joist in T beam construction in which the slab forms the principal compression member.

HOWARD F. YOUNG.