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IMPROVEMENTS IN AND RELATING TO COMPOSITE BEAMS.

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Description

The present invention relates to an improvement in a twin-webbed floor beam of steel in composite action with concrete, wherein said beam comprises at least one projecting, horizontal bearing plate for supporting floor structures and said improvement consists of a ladder intended to be fastened to an upper part of the beam in its longitudinal extension.

For steel beams in composite action with concrete it is necessary that the transmission of shear force between the steel cross-section and concrete is guaranteed. This is often done by aid of so called studs (bolts), which are welded to the steel beam, preferably to its upper flange. Depending on actual forces which shall be transmitted, a lot of studs can be required. In the composite cross-section concrete only takes up compression forces, sometimes together with a smaller part of the steel cross-section, while the tensile forces are only taken up by the steel. Before the concrete has hardened the load carrying capacity is therefore limited since the concrete compression zone is lacking. The load carrying capacity of the steel cross-section itself often is so limited that not even the dead load of the floor can be supported, hence the beam must be propped until the concrete has obtained the strength required. The propping involves an evident drawback, since it often is a bar for rational construction.

US-A-2 731 824 discloses a steel beam comprising a projecting horizontal bearing plate suitable for supporting floor structures and a ladder which is fastened to an upper part of the beam, and which comprises two longitudinal profiles running parallel to and in a predetermined distance from each other and a number of transverse connecting elements extending between said profiles in a predetermined distance from each other. However, here the function is not a static composite action construction between steel and concrete as the fact is according to the present invention, but the concrete takes mainly the forces and the function of the steel envelope or housing is to facilitate cross-connecting between the arcs. The ties which have a ladderlike appearance have no force transferring function, but only a function in keeping together the two parts of the steel envelope.

An object of the present invention is to provide an improvement in the form of a separate and prefabricated ladder in composite beams by which the steel area of the upper part of a beam in a simple way can be increased and hereby increase the compression zone of the steel cross-section before the hardening of the concrete. By this the need for propping is eliminated in the same time as said ladder in an effective way guarantee the transmission of shear force between steel and concrete in the composite cross-section. The ladder also means that the manufacturing of the same can be rationalized in that it can be

prefabricated in a number of variants and sizes and be kept in stock for use to different beam sizes depending on loads and spans. The ladder also has such a design that it very easy and quickly can be fixed to the upper part of a floor structure supporting beam e.g by longitudinal, intermittent welding, which also can be performed by an automatic machine. The characteristic features of the invention are set forth in the following claims.

The invention will now be described in more detail below with reference to the accompanying drawing, which illustrates a preferable embodiment of the ladder according to the invention in a schematic perspective view, when it is mounted to the upper part of a steel beam schematically indicated.

As will be seen from the drawing it illustrates a schematically indicated, as a composite beam formed steel twin-webbed beam 1 in a perspective view having a preferable embodiment of the present invention in the form of a prefabricated ladder 2, which is fastened to an upper part 6 of the beam 1 in its longitudinal extension. The beam 1 is made of steel and has a form not closer illustrated in the drawing, which admits a composite action with concrete and comprises at least one projecting, horizontal bearing plate 3 for supporting floor structures 4. The prefabricated ladder 2 comprises at least two longitudinal profiles 5 running parallel to and at a predetermined distance from each other, said profiles 5 are positionally fixable to the upper part 6 of the beam 1. In the preferred embodiment illustrated, the profiles 5 consist of steel bars of rectangular cross section. A number of transverse connecting elements 7 provided in a predetermined distance from each other extend between the profiles 5. These bring about necessary transmission of shear force for static composite action between the beam 1 and concrete which is performed later.

In a preferred embodiment according to the present invention, the connecting elements 7 consist of steel angle profiles with an apex formation 8, which are fixed by welding to the longitudinal profiles 5 with their axes perpendicular to the webs of said twin-webbed beam. The connecting elements 7 can be designed with any suitable form, but steel angle profiles are to be preferred. The connecting elements 7 are mounted parallel to each other with a mutual spacing of about 200-600 mm along the whole extension of the ladder 2.

Claims

1. A ladder in a steel twin-webbed beam (1) for use in composite action with concrete, said beam (1) comprising at least a projecting, horizontal bearing plate (3) for supporting floor structures (4) and said ladder (2) being fastenable to an upper part (6) of said twin-webbed beam (1), **character-**

ized in that said ladder (2) is a separate and pre-fabricated ladder comprising at least two longitudinal profiles (5) running parallel to and at a pre-determined distance from each other, said profiles (5) are positionally fixable to the upper part (6) of the beam (1) and between said profiles a number of transverse shear connecting elements (7) extend at a pre-determined spacing from each other for transfer of shear force between the beam (1) and concrete under said composite action.

2. A ladder according to claim 1, **characterized in** that the connecting elements (7) consist of steel angle profiles, which are fixed to the longitudinal profiles (5) with their axes perpendicular to the webs of said twin-webbed beam.
3. A ladder according to claim 1, **characterized in** that the longitudinal profiles (5) consist of steel bars of rectangular cross section.
4. A ladder according to claim 1 or 2, **characterized in** that the connecting elements (7) are provided parallel to each other with a mutual spacing of about 200-600 mm.

Patentansprüche

1. Leiter in einem Doppelsteg-Stahlträger (1) zur Verwendung in einer Verbundwirkung mit Beton, wobei der Träger (1) wenigstens eine vorstehende horizontale Lagerplatte (3) zum Abstützen von Bodenstrukturen (4) aufweist und die Leiter (2) an einem oberen Teil (6) des Doppelsteg-Trägers (1) befestigbar ist, dadurch gekennzeichnet, daß die Leiter (2) eine getrennte und vorgefertigte Leiter ist, die wenigstens zwei Längsprofile (5) aufweist, die parallel zueinander und in einem vorbestimmten Abstand voneinander verlaufen, wobei die Profile (5) an dem oberen Teil (6) des Trägers (1) positionsmäßig befestigbar sind und zwischen den Profilen eine Anzahl von quer verlaufenden Scherverbindungselementen (7) mit einem vorbestimmten wechselseitigen Zwischenraum für die Übertragung einer Scherkraft zwischen dem Träger (1) und Beton unter der Verbundwirkung verlaufen.
2. Leiter nach Anspruch 1, dadurch gekennzeichnet, daß die Verbindungselemente (7) aus Stahl-Winkelprofilen bestehen, die an den Längsprofilen (5) mit ihren Achsen senkrecht zu den Stegen des Doppelsteg-Trägers befestigt sind.
3. Leiter nach Anspruch 1, dadurch gekennzeichnet, daß die Längsprofile (5) aus Stahlträgern mit

rechteckigem Querschnitt bestehen.

4. Leiter nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Verbindungselemente (7) parallel zueinander mit einem wechselseitigen Zwischenraum von etwa 200 - 600 mm vorgesehen sind.

Revendications

1. Une échelle d'une poutre en acier (1) à deux voiles, à utiliser dans une action composite avec du béton, ladite poutre (1) comportant au moins une plaque de support horizontale (3) en saillie pour supporter des structures de plancher (4), et ladite échelle (2) pouvant être fixée à une partie supérieure (6) de ladite poutre (1) à deux voiles, caractérisée en ce que ladite échelle (2) est une échelle séparée et préfabriquée comportant au moins deux profilés longitudinaux (5) s'étendant parallèlement et à une distance prédéterminée l'un par rapport à l'autre, lesdits profilés (5) peuvent être fixés en position à la partie supérieure (6) de la poutre (1), et une pluralité d'éléments (7) de liaison et de cisaillement s'étendent entre lesdits profilés suivant un espacement prédéterminé l'un par rapport à l'autre pour la transmission des forces de cisaillement entre la poutre (1) et le béton sous ladite action composite.
2. Une échelle selon la revendication 1, caractérisée en ce que les éléments de liaison (7) sont constitués de profilés d'acier en cornière, qui sont fixés aux profilés longitudinaux (5), leurs axes étant perpendiculaires aux voiles de ladite poutre à deux voiles.
3. Une échelle selon la revendication 1, caractérisée en ce que les profilés longitudinaux (5) sont constitués par des barres en acier de section droite rectangulaire.
4. Une échelle selon la revendication 1 ou 2, caractérisée en ce que les éléments de liaison (7) sont disposés parallèlement l'un à l'autre suivant un espacement mutuel d'environ 200-600 mm.

