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Blumenthal et al.

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[54] **CONVEYOR TROUGH FOR SCRAPER-CHAIN CONVEYORS**

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[51] **Int. Cl.** **B65g 15/60**

[58] **Field of Search** 198/168, 204

[56] **References Cited**

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[57] **ABSTRACT**

The trough has transversely spaced mirror-symmetrical sidewalls of substantially sigma-shaped cross-section connected by a transverse wall extending between them substantially midway of their height. The sidewalls each have an outer side provided with a longitudinally extending first groove of substantially trapezoidal cross-section and having a transverse depth smaller than the height of its open side, with the latter height being greater than one third of the height of the respective side wall. Each sidewall each has an inner side provided with a pair of inwardly open longitudinally extending grooves which are located above and below the transverse wall, respectively, and which are each bounded in part by one side wall portion extending from an upper or lower ridge towards the transverse wall and having an inwardly directed semi-circularly curved face of a large first radius, and in part by an inwardly inclined second side wall portion extending from the first sidewall portion to the transverse wall and in addition bounding one side of the outer groove, with the second sidewall portion having a wing-shaped curvature over at least part of its length intermediate the first side wall portion and the transverse wall in outward direction and on a second radius which is substantially larger than the first radius.

4 Claims, 2 Drawing Figures

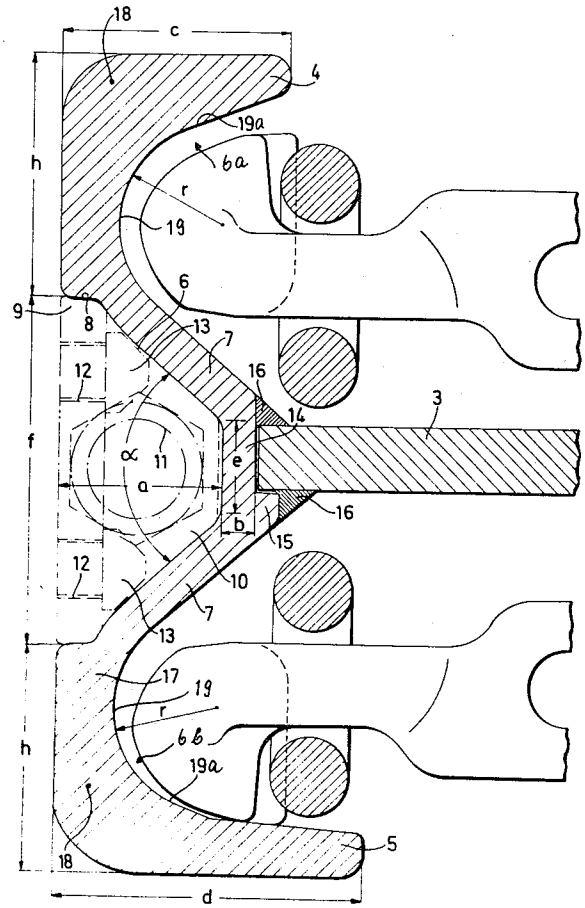
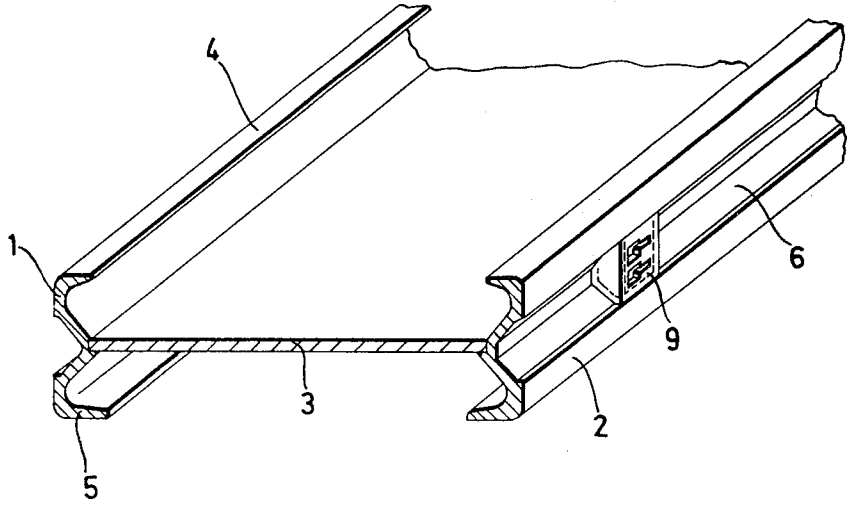


FIG. 1



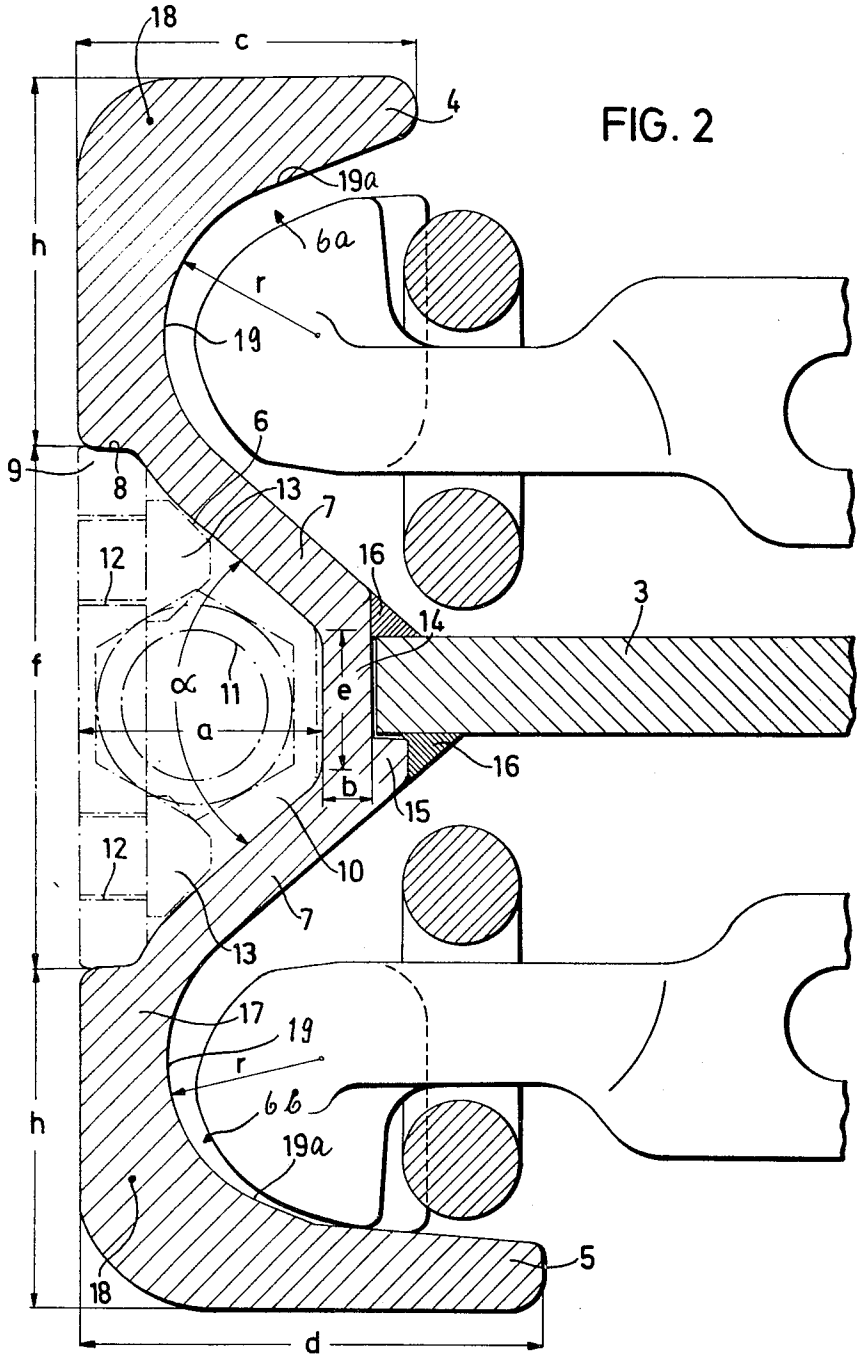

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FIG. 2

CONVEYOR TROUGH FOR SCRAPER-CHAIN CONVEYORS

BACKGROUND OF THE INVENTION

The present invention relates generally to a conveyor trough, and in particular to a conveyor trough for scraper-chain conveyors. Still more particularly the invention relates to a conveyor trough which is usable with particular advantage —although not exclusively—in dual-chain scraper conveyors.

Scraper-chain conveyors, and the troughs used in them, are already known per se and require no detailed description. It is merely necessary to point out that these troughs are provided with sidewalls which are connected with a transverse wall on which material is to be conveyed, and the side walls are provided with inwardly open grooves into which portions of the scraper-chains extend, so that the scraper chains are guided by these portions with respect to the trough. The prior art proposes a trough construction for use with dual-chain scraper-chain conveyors wherein the inwardly directed open grooves are located respectively above and below the transverse wall, and wherein the outwardly directed side of each side wall of the trough is further provided with an outwardly open groove located substantially midway between the upper and lower edge of the sidewall and serving to accommodate coupling screws, mounting screws, inserts or other components which must be used in conjunction with the trough. Seen in profile the sidewall of such a trough of the prior art has an upper shorter tank of relatively significant length corresponding to approximately half the height of the sidewall, and the wall portions which delimit the outer groove define a triangularly profiled rib with a low-height strip on which an edge of the transverse wall can be secured by welding. This triangularly profiled rib does not project inwardly as far as the profile flanges, the depth of its projection is nevertheless substantial. Other constructions propose to shorten the upper and lower profile flanges but to leave the triangularly profiled rib unchanged, or to provide it with a connecting portion of greater or lesser length which is to be connected with the transverse wall.

In the known prior-art constructions the profiled configuration of the sidewalls of the trough has always been such that the cross-section of the outer groove in the respective sidewall is inadequate to accommodate all of the auxiliary components which should be capable of being accommodated, for instance coupling screws or the like. This is, of course, disadvantageous because it strictly limits the utility and versatility of such a trough.

Moreover, the known troughs require relatively much material, because their configuration requires certain minimum dimensions, aside from the fact that in order to be able to withstand the stresses they have to have certain dimensions and weight. Of course it is conceivably possible to reduce the amount of material involved, and therefore the costs for the material, by making the wall thicknesses of the trough smaller. In fact, it is conceivable to choose a different cross-sectional configuration for the sidewalls of the trough than what is known from the art, simplifying the configuration and thereby making the manufacture of the trough less expensive. However, this has inevitably been found to be capable of accomplishment only at the expense of reducing the quality of the trough per se, that is reducing its lifetime, its strength, and its ability to withstand stress.

SUMMARY OF THE INVENTION

Accordingly it is a general object of the present invention to provide an improved conveyor trough for scraper-chain conveyors, which is not possessed of the aforementioned disadvantages.

More particularly it is an object of the invention to provide such an improved conveyor trough for scraper-chain conveyors in which the sidewalls can be relatively low but the advantages of the prior art nevertheless overcome.

An additional object of the present invention is to provide such an improved conveyor trough which is less expensive to construct, both from a point of view of the material required and from a point of view of the time and labor involved.

Still another object of the invention is to provide such an improved conveyor trough in which the possibility exists for a much readier connection of auxiliary components than those previously possible.

In pursuance of these objects, and of others which will become apparent hereafter, one feature of the invention resides in a conveyor trough for scraper-chain conveyors which, briefly stated, comprises a pair of transversely spaced mirror-symmetrical sidewalls of substantially sigma-shaped cross-section and having upper and lower edges spaced by a predetermined height, and a transverse wall extending between and fast with the sidewalls substantially midway of the predetermined height.

According to the invention each of the sidewalls has an outer side provided with a longitudinally extending first groove which is of substantially trapezoidal cross-section and which has a transverse depth smaller than the height of its open side with such height being greater than one third of the predetermined height. The inner side of each side wall is provided with a pair of inwardly open longitudinally extending second grooves respectively located above and below the transverse wall, and each of these second grooves is bounded in part by a first sidewall portion extending from the respective edge towards the general plane of the transverse wall and having an inwardly directed substantially semi-circular curved face of a large first radius; further, each second groove is also bounded in part by an inwardly inclined second sidewall portion which extends from the first sidewall portion to the transverse wall and which additionally balance one side of the first groove. The second sidewall portion has a wing-shaped curvature over at least part of its height intermediate the first sidewall portion and the transverse wall in outward direction and on a second radius which is substantially larger than the first radius.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary partially sectioned perspective view illustrating a portion of a conveyor through according to the present invention; and

FIG. 2 is a fragmentary detail view, on an enlarged scale, through one sidewall and portion of the transverse wall of the conveyor trough shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing the drawing in detail it will be seen that only a portion of a conveyor 12 for scraper-chain conveyors, constructed according to the present invention, has been shown in FIG. 1. No attempt has been made in FIG. 1 to show accurate relationships of various portions of the respective sidewalls of the conveyor trough, because FIG. 1 is only intended for providing a general indication of the appearance of the through, whereas the specific details of the general relationship of the portions of the sidewalls are shown in FIG. 2.

With this in mind it will be seen that the conveyor trough in FIG. 1 is of the type which is used with a dual-chain scraper-conveyor and has two mirror-symmetrical sidewalls 1 and 2 of substantially sigma-shaped cross-sectional one-piece profile. The conveyor chains are fragmentarily shown (not referred) for better understanding. The trough itself, it will be understood, is stationary and it is the chain which move relative to the trough, longitudinally thereof. These profiles, usually provided by a rolling operation, are connected intermediate the upper and lower edges with a transverse wall 3 which is advantageously welded to them, with a welded seam being illustrated at 16 above and below the transverse wall in FIG. 2.

With respect to the general plane of the transverse wall 3 the sidewalls 1 and 2 are of substantially symmetrical upper and lower halves, as is evident from FIG. 2 wherein only the left-hand sidewall 1 is shown, it being understood that the right-hand side wall 2 is identical with it but mirror-symmetrical relative to it.

The upper half of each side wall has an upper inwardly extending profile flange 4, and the lower half has a similar inwardly directed lower profile flange 5 which is slightly longer in inward direction than in flange 4. The outer side of the sidewall 1 is provided substantially midway intermediate the upper and lower edges with a longitudinally extending groove 6, and the inner side is provided above and below the transverse wall 3 with two longitudinally extending grooves 6*a*, 6*b*, respectively. The grooves 6*a* and 6*b* are open inwardly, that is towards the conveying area, whereas the groove 6 is open outwardly as illustrated.

The groove 6 is of substantially trapezoidal cross-section which diverges in outward direction; it is bounded by side wall portions 7 which merge in the region of the outer open side into portions 8 forming a step. At its longitudinal end regions and, if desired, in the middle region inserts 9 may be located in the groove (illustrated in broken lines in FIG. 2) which are secured in suitable manner, for instance by welding, and provided with longitudinal openings in which coupling members 11 may be received. The coupling members 11 may be of bolt-like configuration and do not form part of the invention, and it should be further noted that the inserts 9 may be provided additionally with bores 12 which may be spaced over the height *f* of the open side of the groove 6 and which may serve for securing of mounting screws 13 for connecting the conveyor trough to ramps,sheet metal baffles, chain guide housings or other auxiliary components. Transverse webs 10 of the inserts 9 are received in the inner part of the groove 6 to stabilize the position of the inserts 9 therein.

As FIG. 2 shows clearly, the depth *a* of the groove 6, added to the wall thickness *b* of the groove bottom 14 is smaller than the dimension *c* of the upper profile flange 4, by appoximately the thickness *b* of the bottom 14.

The bottom 14 is provided on its inwardly facing side with a low projecting rib 15 to which the transverse wall 3 is secured by means of the welded seams 16. Because the height of the bottom of the groove 6 at the inner side is relatively great, strong upper and lower welded seams 16 can be provided.

As already pointed out, the length *d* of the lower profile flange 5 is greater than the length *c* of the upper profile flange 4. Advantageously the differential will be approximately one third, that is the length *d* will be greater by approximately one third than the length *c*, so that when the chains move from the upper run into the lower run —that is from the upper groove 6*a* into the lower groove 6*b*, the lateral chains of the scraper chains can slide on these longer flanges 5, as is evident in FIG. 2.

The height *e* of the bottom of the groove 6 is a fraction of the height *f* at the outer side of the groove 6, and the side *f* —which is the greatest height of the groove 6— is substantially greater than each of the two height portions *h* of the sidewall portions 17. The angle alpha included between the surfaces of the portions 7 which bound the groove 6 is substantially greater than 60°, but preceptibly smaller than 90°, and is advantageously between 75° and 85°, preferably between substantially 80° and 82°.

According to an important feature of the invention the portions 7 are outwardly curved away substantial part of their length in wing-shaped configuration on a rather large radius which is considerably larger than the radius *r* on which the surfaces 19 are curved which bound the grooves 6*a* and 6*b* in conjunction with the portions 7. These grooves are, incidentally, additionally bounded by surfaces 19*a* extending to the inner free ends of the respective flanges 4 and 5 and including with the surfaces 19 an angle of substantially 20°.

Because of the outwardly bowed configuration of the portions 7 the inwardly directed surfaces thereof are somewhat concave whereas the outwardly directed surfaces thereof (bounding the groove 6) are somewhat convex. This means that the groove 6 is relatively wide in the region of its bottom wall, thus providing more space for auxiliary components to be located in this region, and on the other hand the height *f* can be such that vertically spaced mounting screws 13 can be inserted into the inserts 9, that is that the mounting screws 13 can be vertically spaced by a relatively significant distance and that their large roofshaped inner ends can be properly supported against the portions 7 (such support is not shown in FIG. 2 in order to be able to better show the outline of the inner ends of the screws 17). Thus, the transverse depth *a* can have the minimum dimension which need not even be half as great as the height *f*.

The corner portions **18** have a thickness which is substantially double the thickness of the side wall portions **17** in a plane intersecting the bottoms of the grooves **6***a* and **6***b*, and the angle included between the inner surfaces of the side wall portions **7** and the surfaces **19***a* is approximately 60°.

We have found it advantageous to so dimension the length *c* of the flange **4** that it is between substantially 2.5 tenths and 3 tenths of the combined dimensions $h + f + h$. The depth *a* including the wall thickness *b* should advantageously be less than the dimension *c* by substantially the wall thickness *b*, and the dimension *f* should advantageously be approximately equal to 4 tenths of the combined dimensions $h + f + h$. The height *e* of the wall **14** may be approximately 3 tenths of the dimension *f*. whereas the depth *a* may be approximately equal to 5 tenths of the dimension *f*. The radius *r* should equal approximately 4 tenths – 5 tenths of the length *c*.

By way of an example —and it should be understand that this is only one possible example given herein for better understanding— the combined dimensions $h + f + h$ may be approximately 250 mm. The dimension *a* may be approximately 50 mm and the dimension *b* approximately 10 mm. The dimensions *c* may be approximately 70 mm and *d* may be approximately 95 mm. *e* in this example may be approximately 30 mm and *f* approximately 105 mm. The radius *r* may be about 32 mm, the thickness of the upper flange **4** may be about 13 mm and the thickness of the lower flange **5** about 11 – 12 mm. The material of the sidewalls **1** and **2** may be steel.

The basic considerations behind the present invention are thus that the dimensions *c* should be relatively small by comparison to the total height $h + f + h$. This means that the dimension *a* of the groove **6** must be no greater than the dimension *c*, whereas on the other hand the dimension *f* should be substantial. It will be appreciated that if the angle alpha were increased beyond what is shown in FIG. **2**, or at least substantially increased, the dimension *f* could also be increased but the channels **6***a* and **6***b* would then be decreased. Particularly if the dimension *c* is relatively small, such a decrease is not desirable. On the other hand, if the angle alpha were substantially decreased from what is shown in FIG. **2**, then the dimension *f* would be correspondingly reduced and it would become much more difficult to provide the inserts **9** and to provide for connection via these inserts of auxiliary components to the respective sidewalls **1** and **2**.

The present invention overcomes the disadvantages of the prior art and provides the advantages which have been outlined above. In particular, the use of various closely adjacent but vertically offset connecting or coupling portions (such as the screws **13**, for instance) is now possible and thus permits the proper connection of auxiliary components with the sidewalls **1** and **2**. On the other hand, the grooves **6***a* and **6***b* can have a maximum dimension and are not reduced in their cross-sectional area at the expense of providing a larger-dimensioned groove **6**.

Sidewalls constructed according to the present invention in such a conveyor trough require less material than was needed for corresponding conveyor troughs in the prior art, and are therefore less expensive to construct from a point of view of the material expenses alone. In addition, they can be more readily produced from a point of view of manufacturing expenses, that is in terms of the time and wages required to make them, and this is true whether one considers the sidewalls in terms of unit weight or in terms of unit length. The expenses of producing such a sidewall are thus held within economically feasible limits but at the high quality which is required of such conveyor troughs which, as is well known, are largely used in mining operations.

The provision of the inserts **9** makes it possible to provide the bores **12** which may be located above and/or below the plane of symmetry (passing horizontally through the transverse wall **3**) for securing of auxiliary components, it being understood that the bolts **11** are located in the plane of symmetry but extending longitudinally of the groove **6** in accordance with what is known per se by persons skilled in the art.

A substantial advantage of the construction according to the present invention resides in the fact that despite its narrow profile, which can be produced simply and at lesser expense by rolling, II was possible to not only provide the stabilizing reinforced corner portions **18** but also to provide the grooves **6***a* and **6***b* of maximum cross-section as well as providing the groove **6** of maximum cross-section and having it diverge towards the outer open side so substantially that it is not only possible to use large-dimensioned and therefore strong coupling bolts **11**, but also to permit the use of several mounting elements (such as the screws **13**) for auxiliary components with these mounting elements being vertically spaced from one another. Furthermore, the entire configuration of the profiles of the side walls **1** and **2** assures that the resistance to deformation is great despite the fact that a saving in material and in width has been effected.

It will be understood tha each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a conveyor trough for scraper-chain conveyors, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended

1. A conveyor trough for scraper-chain conveyors, comprising a pair of transversely spaced mirror-symmetrical sidewalls of substantially signa-shaped cross-section and each having upper and lower edges spaced by a predetermined height, each of said sidewalls comprising a vertical intermediate portion, two thin sidewall portions divering from said intermediate portion and bounding an outwardly directed first groove, two thick sidewall portions each having a juncture with and extending from one of said thin sidewall portions in a direction parallel to but at a location outwardly spaced from said intermediate portion, a pair of

flanges each extending inwardly from one of said thick sidewall portions normal to and spaced from said intermediate portion, said thin and thick sidewall portions and said flanges bounding two inwardly directed part-cylindrical second grooves located above and below said intermediate portion, respectively, said thin sidewall portions including between themselves in the region of said juncture an angle of between substantially 80° and 82°, the maximum height of said first groove substantially equalling four-tenths of said predetermined height, the height of said intermediate portion being equal to substantially three-tenths of said maximum height, the depth of said first groove equalling substantially five-tenths of said maximum height, the length of said flanges being substantially three-tenths of said predetermined height, an angle included between respective upper and lower edges of said flanges being substantially 20° so that the thickness of corner regions defined where said flanges extend from said thick sidewall portions is equal to substantially double the minimum thickness of said thick sidewall portions, and the radius of curvature of said second grooves in said corner regions being between substantially four-tenths and five-tenths of the length of the respective flanges; and a transverse wall extending between and fast with said sidewalls substantially midway of said predetermined height.

2. A conveyor trough for scraper-chain conveyors as defined in claim **1,** wherein at least said sidewalls are made of metal.

3. A conveyor trough for scraper-chain conveyors as defined in claim **1,** said outwardly directed groove comprising longitudinal end regions and a middle region; and further comprising inserts secured in at least one of said regions.

4. A conveyor trough for scraper-chain conveyors as defined in claim **3,** wherein said inserts are provided with longitudinal openings in which coupling members may be received.

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