United States Patent [19]

Kistler

[11] **3,854,693**

[45] **Dec. 17, 1974**

[54] **SUPPORT SYSTEM FOR CONCRETE FORMS**

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[30] **Foreign Application Priority Data**

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Apr. 15, 1971 Switzerland 5502/71

[52] **U.S. Cl.** **249/210**
[51] **Int. Cl.** **E04g 17/00**
[58] **Field of Search** ..... 249/18, 19, 23, 26, 47, 249/219, 210; 52/665, 488, 579, 732, 656; 287/189.3 LA

[56] **References Cited**

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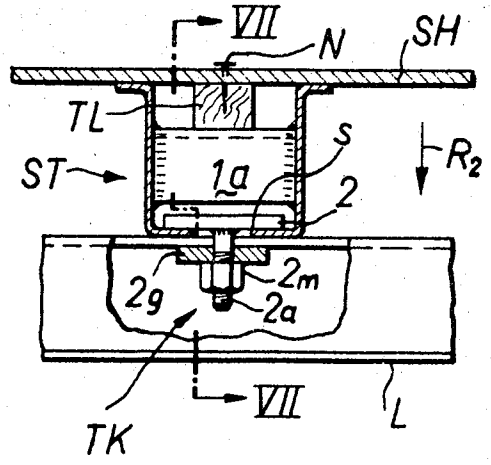
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Primary Examiner—John E. Murtagh
Attorney, Agent, or Firm—Werner W. Kleeman

[57] **ABSTRACT**

A support system for concrete forms, comprising form support means, each of said form support means comprising two similar and essentially parallelly extending and spaced substantially Z-shaped profile elements, having traverse means applied to the profile web means for maintaining the Z-shaped profile elements spaced from one another and arranged in such a fashion with respect to the form sheathing that their oppositely directed or diverging flanges come to lie at the load side of the form support, while their flanges which confront one another at the girder side leave free between themselves a slot which is continuous and extends over the entire length of each of the form support means. Support clamp means fixedly clamp the girders with the form support means, these support clamp means being introduced from the front of the associated form support means into such and perpendicular thereto and through the support slot thereof. Coupling clamp means fixedly clamp support extensions introduced from the end into the form support means therewith, such coupling clamp means being introduced from the rear side of the form support means into such and through the support slot.

20 Claims, 23 Drawing Figures



PRIOR ART

Fig. 1

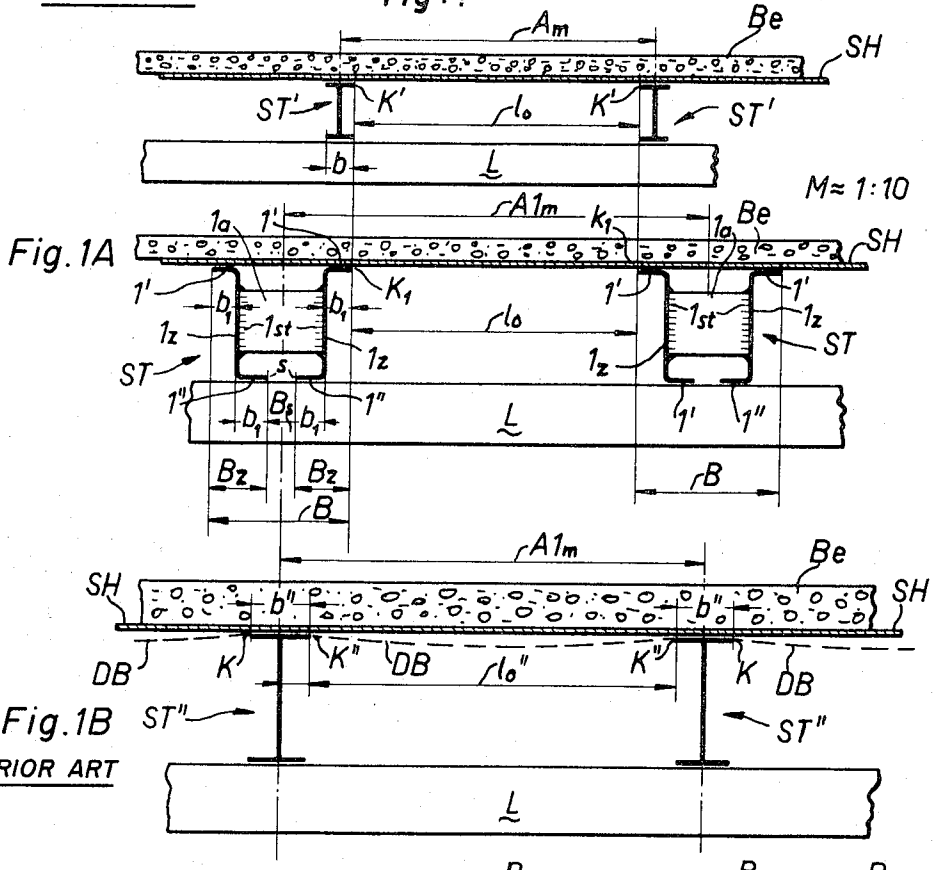
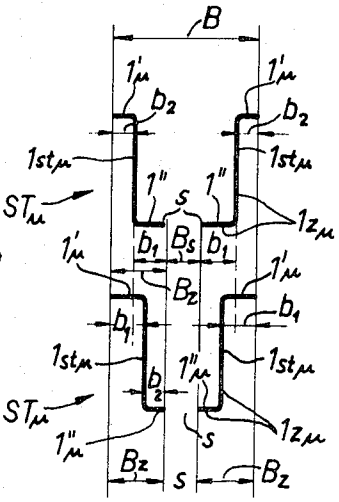


Fig. 2



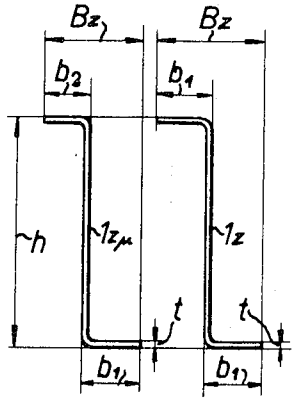


Fig. 4
M≈1:5

Fig. 5

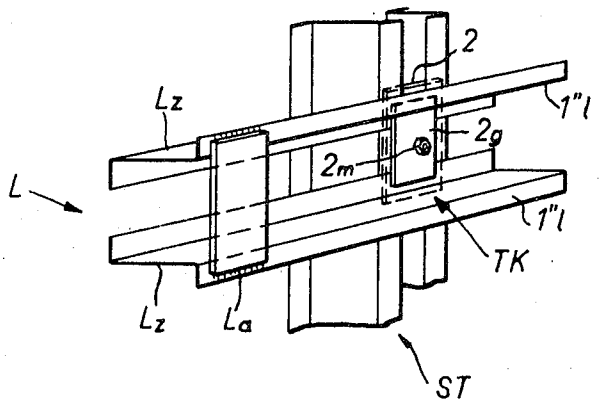


Fig. 6

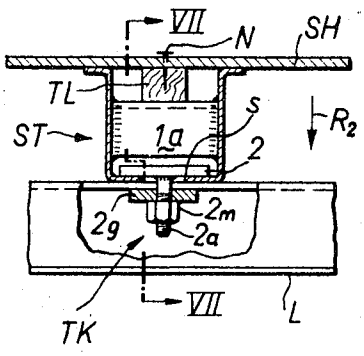
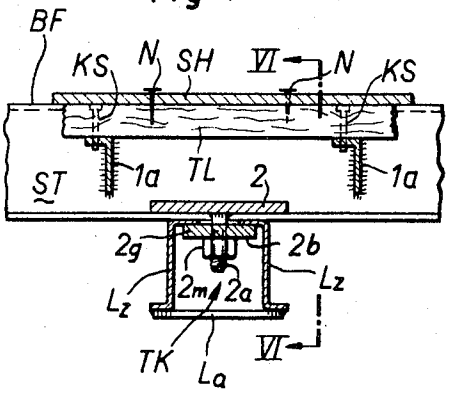


Fig. 7



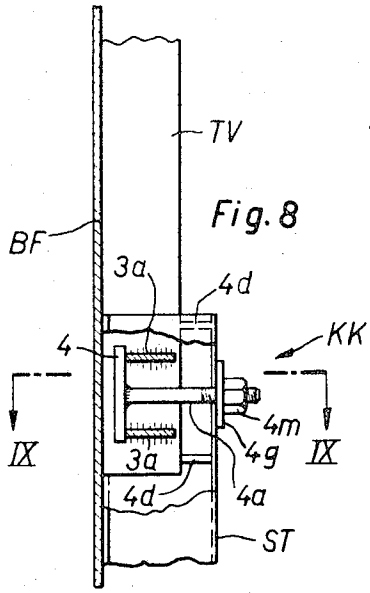


Fig. 8

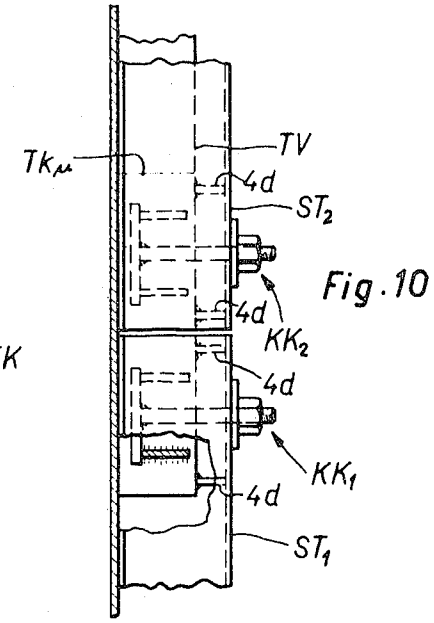


Fig. 10

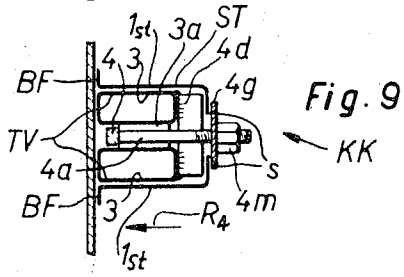


Fig. 9

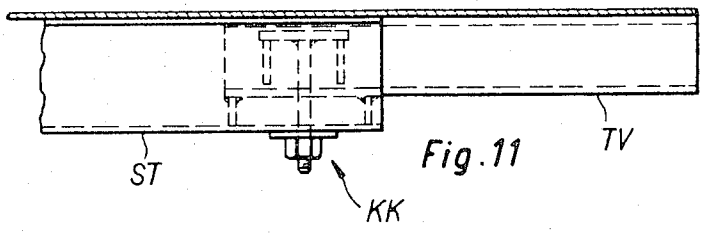


Fig. 11

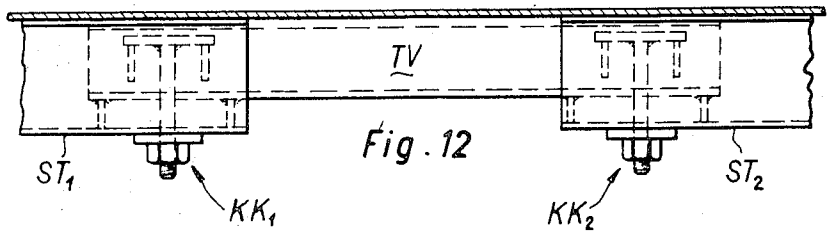


Fig. 12

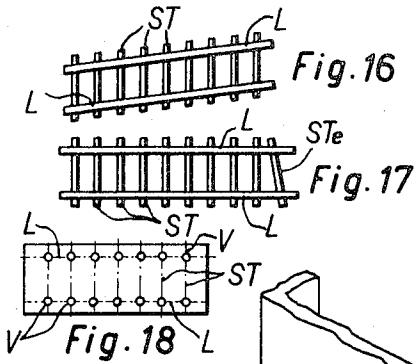


Fig. 16

Fig. 17

Fig. 18

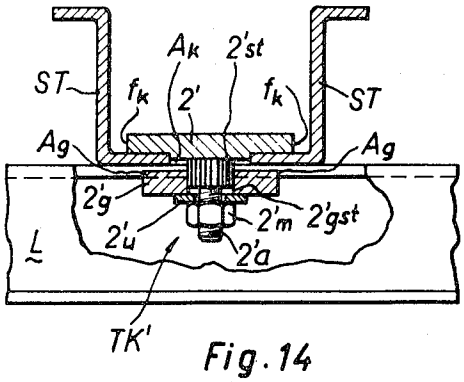


Fig. 14

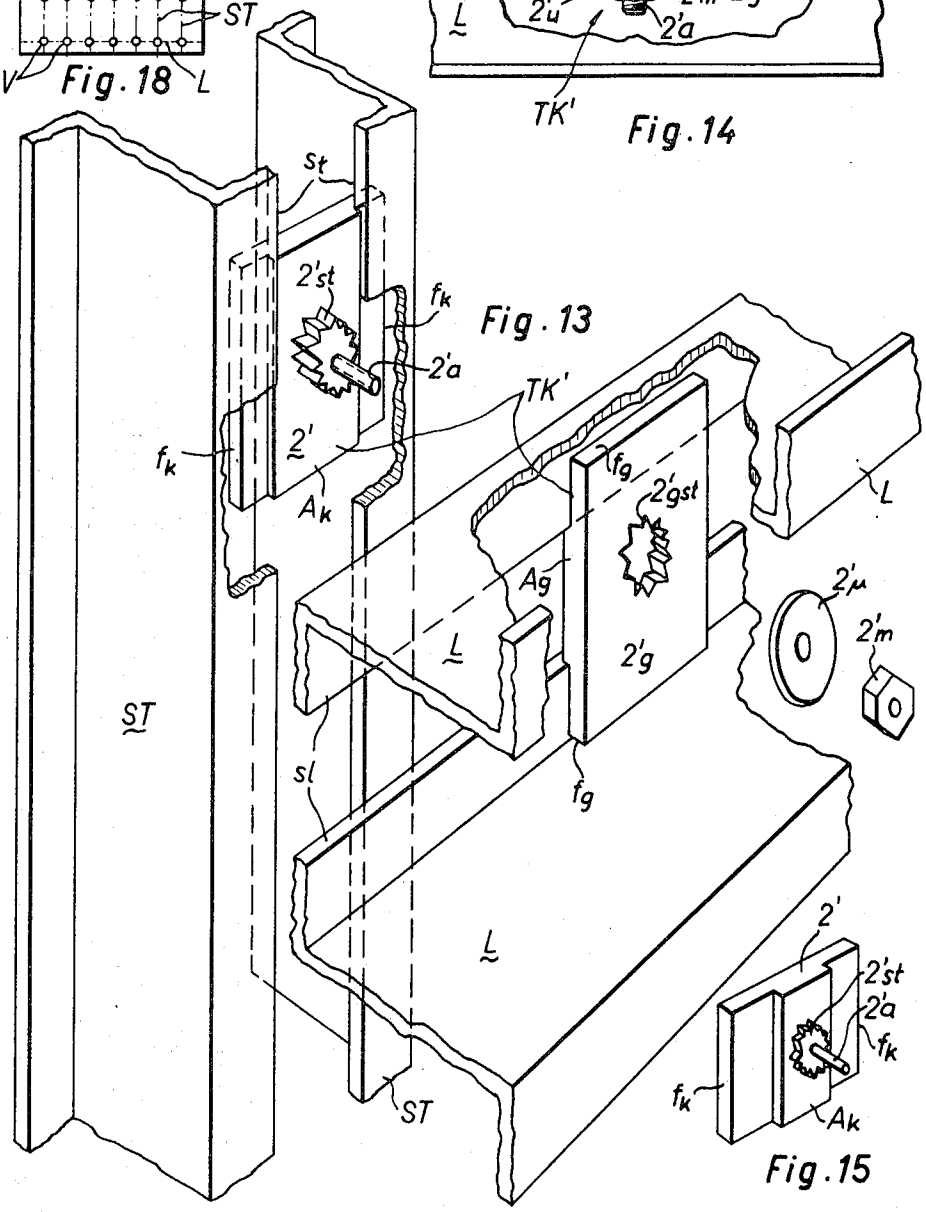


Fig. 13

Fig. 15

Fig.19

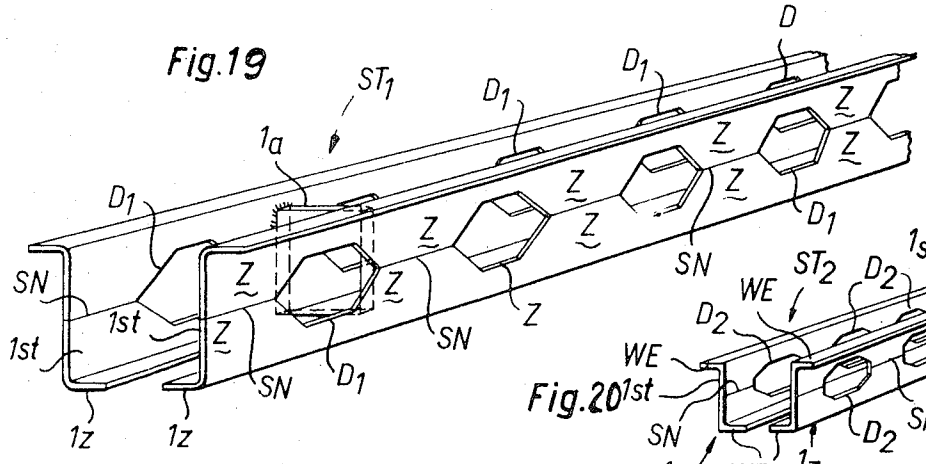


Fig.20

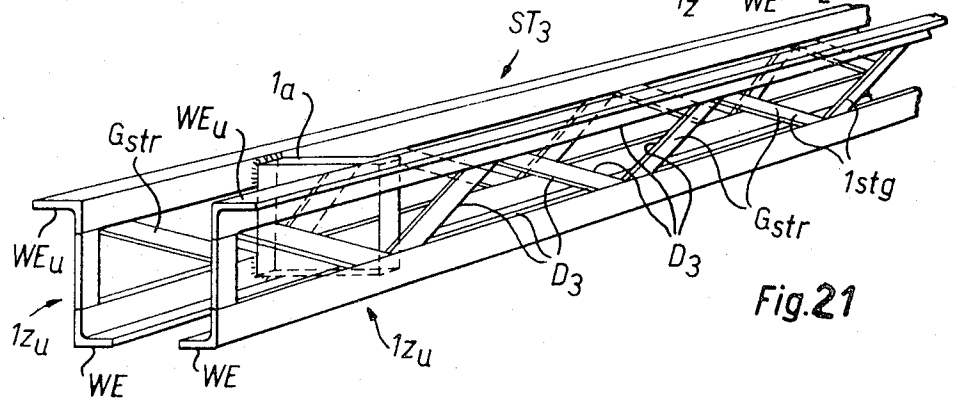


Fig.21

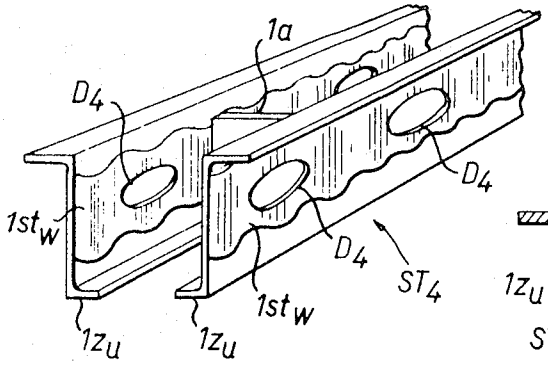


Fig. 22

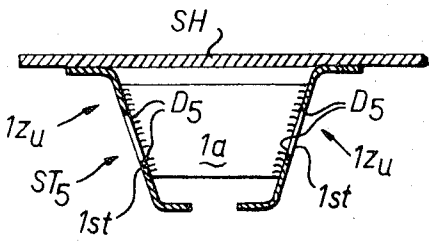


Fig. 23

SUPPORT SYSTEM FOR CONCRETE FORMS

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved support system for concrete forms or formworks.

The conventional formwork supports for a concrete form typically usually constructed as I-shaped profiles and formed of steel or wood, whether such be used for walls or ceilings, must be able of not only positively taking up the pressure exerted by the concrete against the form sheathing or skin which, as is known, can amount to 6 tons/m^2, but further must be capable of taking up these high pressures without deformation of the formwork sheathing so as to ensure for an exact planar concrete surface. It is for this reason that the spacing, that is to say, the central distance between each two neighboring form supports must be relatively small, otherwise the form sheathing tends to deviate, in other words bend out between the supports. Owing to the considerably large number of form supports this requires, on the one hand, a large expenditure of material for the supports and, on the other hand, also a considerable expenditure of time for the erection and dismantling of the form or formwork, so that the costs thereof, constituting a factor in the overall building cost, are quite high. Furthermore, a disadvantage in the fabrication of these forms is the fact that the constructional height of the form support must be relatively large. Moreover, a further disadvantage is present with the conventional support systems for concrete forms in that, notwithstanding or in fact because of their standardization and owing to faulty or insufficient adjustability, these support systems cannot readily be accommodated to the many different practical requirements which are encountered in construction work so that oftentimes costly changes and cumbersome and time-consuming adjustment and repair operations are required at the construction site.

SUMMARY OF THE INVENTION

Therfore, from what has been stated above it will be seen that the prior art is still in need of a support system for concrete forms which is not associated with the aforementioned drawbacks and limitations. Hence, a primary objective of the present invention is to provide new and improved constructions of support systems for concrete forms which effectively and reliably satisfies the existing need in the art and extensively overcomes the aforementioned drawbacks prevailing with the prior art constructions discussed above.

Another and more specific objective of the present invention which is directed towards overcoming the aforementioned drawbacks, more specifically relates to the provision of a support system for concrete forms wherein the expenditure of material and work is considerably less than for the heretofore known prior art support systems, further wherein the support system of the invention can be employed with smaller support heights than heretofore possible and which satisfies in a much better fashion the momentarily encountered construction requirements.

Still a further object of the present invention is to provide a novel support system which can be combined in a very simple and advantageous manner with the girdling or girder system proposed in my copending

United States application, Ser. No. 108,771, filed Jan. 22, 1971, now U.S. Pat. No. 3,711,059.

Yet a further significant object of the present invention is directed to improved constructions of support systems for formworks manifested by the simple and economical design thereof, the economies in the use and manufacture thereof, the ability to quickly erect and dismantle such without any great problem or time consuming work, and also the capability of using such without necessitating complicated adjustment or modification operations in conjunction with many different constructional conditions encountered at the construction site.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the invention contemplate the provision of a novel support system for concrete forms or formworks which is manifested by the features that each form support embodies two respective Z-shaped profiles which are similar to one another and extend in parallelism with respect to one another. The Z-shaped profiles are spaced from one another by traverses or crosstie rods mounted at the webs of the profiles. Further, these Z-shaped profiles are arranged with respect to one another and with respect to the sheathing or skin of the form in such a fashion that their diverging flanges bear upon the loaded side of the form support and their flanges confronting one another at the side of the girders provide therebetween a slot which is continuous over the entire length of the form support. Additionally, support clamps are provided for fixedly clamping the girders to the form supports, these support clamps being insertable from the front side of the from support in a direction perpendicular thereto and through the support slot. Coupling clamps serve to fixedly clamp support extensions with the form supports, these support extensions being insertable from the end into the form support. The coupling clamps can be inserted from the rear of the form support into such and through the support slot.

A further aspect of the inventive support system resides in the features that the support or carrier clamp which can be inserted from the front side into the form support comprises a head plate, an anchor fixedly secured to the head plate and provided with external threading, a counter plate which can be loosely seated upon the anchor and a threaded nut member, and furthermore, wherein the diameter of the anchor is smaller than the width of the support slot.

An additional facet of this invention as concerns the support system can be seen in that the support extension consists of two similar, spaced profile elements which are in parallelism with one another and connected with one another by webs, preferably these profile elements being in the form of hollow profiles of rectangular cross-sectional configuration and provided with spacer elements mounted fixedly thereat. The width of the total cross-sectional area of the support extension is smaller than the mutual spacing of the webs of both Z-shaped profiles of the form support.

According to a further feature of the inventive support system the coupling clamp which can be inserted from the rear of the form support into the latter comprises a head plate, an anchor equipped with external threading which is fixedly mounted to the head plate, a counter plate inserted onto the threaded anchor and a threaded nut member, and wherein the diameter of

the anchor as well as the width of the head plate is smaller than the width of the support slot and the mutual spacing of both hollow profile elements of the support extension.

It is within the contemplation of this invention to form the form support either from two respective differently flanged Z-shaped profiles, the larger flange of which is arranged at the rear of the support and can confront one another, or, however, can be composed of two similarly flanged Z-shaped profiles.

A further aspect of this development resides in the fact that the support system uses traverses or crosstie rods for the form support which are composed of iron angle members, one leg of which is provided with a threaded bore for receiving a wooden support or carrier ledge for the form sheathing.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1A is a top plan view of the inventive support system for a wall formwork and also shows same in comparison with a respective conventional support system as shown in FIGS. 1 and 1B;

FIG. 2 is an end view of a form support composed of two differently flanged Z-shaped profiles with the longer flanges arranged at the rear thereof;

FIG. 3 is an end view of a form support similar to FIG. 2 and composed of the same differently flanged Z-shaped profiles as in FIG. 2, but with the longer flanges this time arranged at the front side;

FIG. 4 illustrates in end view a respective similarly flanged and differently flanged Z-shaped profile of a form or formwork support;

FIG. 5 is a perspective view showing details of the attachment of a girder with the form support;

FIG. 6 is a cross-sectional view through the form support of FIG. 7, taken substantially along the line VI—VI thereof, showing details of the support clamp for attaching the girder with the form supports;

FIG. 7 is a cross-sectional view through the girder shown in FIG. 6, taken substantially along the line VII—VII thereof, and showing details of the support clamp of FIG. 6;

FIG. 8 is a side view, partially in section, of a wall formwork support equipped with a support extension and coupling clamp means;

FIG. 9 is a cross-sectional view through the form support and the support extension introduced therein as shown in FIG. 8, taken substantially along the line IX—IX thereof, and showing details of the coupling clamp of FIG. 8;

FIG. 10 is a side view of two wall form supports interconnected by a support coupling and coupling clamp;

FIG. 11 is a side view of a ceiling form support equipped with support extension and coupling clamp;

FIG. 12 is a side view of two ceiling form supports interconnected with one another by a support extension which is simultaneously utilized as the support coupling and the coupling clamps;

FIG. 13 is a perspective exploded view of a support clamp designed according to a different embodiment of the invention and serving for attachment of the girder with the form support;

FIG. 14 is a cross-sectional view of the support clamp illustrated in FIG. 13;

FIG. 15 is a perspective view of the head plate of the support clamp depicted in FIGS. 13 and 14;

FIG. 16 is a plan view of a bracing wall form at a descending street;

FIG. 17 is a plan view of a wall form having an inclined positioned terminal form support;

FIG. 18 is a plan view of the framework or skeleton of a wall form;

FIG. 19 is a perspective view of a form support wherein both of the equal leg Z-shaped profile elements are constructed as honeycomb supports and in each case are formed of a single standard Z-shaped profile element having similar legs or leg portions;

FIG. 20 is a perspective view of a form or formwork support wherein both of the Z-shaped profile elements possessing similar legs are constructed as honeycomb supports and in each case are formed of two iron angle members having different legs;

FIG. 21 is a perspective view of a form or formwork support composed of two Z-shaped profile elements having different legs or leg portions and constructed as a grip support and fabricated from respective iron angle members one of which has the same legs and the other of which different legs;

FIG. 22 is a perspective view of a form or formwork support wherein both of the Z-shaped profiles have different legs and possess undulated webs; and

FIG. 23 is a cross-sectional view of a formwork or form support wherein the webs of both Z-shaped profile elements which have different leg portions diverge towards the loaded side of the support.

DETAILED DESCRIPTION OF THE PREFFERED EMBODIMENTS

Describing now the drawings, in FIG. 1 there are illustrated two conventional form or formwork supports ST' constructed as I-shaped profile elements and formed of steel or wood, these form supports ST' being arranged adjacent one another at a mutual center-to-center distance A_m. At the load side of the form support ST' there is located the form sheathing or skin SH which bounds by means of its free surface one side of the concrete layer Be. At the rear of the form support ST' there is arranged in known manner the girders L serving to reinforce the form or formwork.

The form sheathing SH can be locally considered at the region of two neighboring form supports ST' as supports having constant cross-section which freely bear upon two carriers or supports, which are uniformly loaded along the free length which corresponds to the often encountered situation where the loading produces bending. The free length 1_o between the supports is formed by the neighboring edges K' of the front flanges of both neighboring form supports St', in other words the flanges at the side of the load, because only both of these flange edges K' represent both effective supports with respect to the bending load. The free length 1_o between the edges K' is decisive for the magnitude of the bending of the form sheathing SH towards the outside at the region between both form supports ST' brought about by the concrete filled into the formwork. For the purpose of attaining an exact planar con-

crete surface this bending through of the form sheathing SH must be maintained as small as possible.

In FIG. 1A there are illustrated two inventive form supports ST, for instance formed of steel, possessing the same free length l_o as was the case for the adjacently arranged form supports ST' of conventional design illustrated thereabove in FIG. 1. Both of the form supports ST consist of two respective similar Z-shaped profile elements 1z extending parallel to one another, these Z-shaped profiles or profile elements being spaced from one another by traverses or crosstie rods 1a applied to their profile webs 1st. Further, these Z-shaped profile elements 1z are not only spaced from one another but also arranged in such a manner with respect to one another and with respect to the form sheathing SH that their diverging flanges 1' bear forwardly at the loaded side of the form support ST and their confronting flanges 1'' located at the side of the girders L form therebetween a free slot which extends continuously over the entire length of the associated form support ST.

Although for the previously discussed conventional form supports St' (FIG. 1) and for the inventive supports ST (FIG. 1A) there is present the same free length l_o determined by the mutual spacing of the flange edges K_1, it will be understood that in the case of the inventive form supports ST, owing to their construction, the mutual center-to-center spacing, designated by reference character Al_m is considerably greater than the corresponding spacing A_m which is present for the conventional supports ST illustrated in FIG. 1, and which will be discussed more fully hereinafter.

If it is assumed for instance that the conventional supports ST' illustrated in FIG. 1 have a width b of the flanges which amounts to 5 centimeters and the free length l_o amounting to 50 centimeters, then the mutual center-to-center spacing A_m of both form supports ST' = 50 cm + 2 × 2.5 cm = 55 cm. On the other hand, for the inventive illustrated form support ST illustrated in FIG. 1A and for the same free length l_o = 50 cm the mutual center-to-center spacing Al_m amounts to 75 centimeters if for instance there is chosen commercially available similarly flanged Z-shaped profile elements having the dimensions 200/50/3 (*cf* the right of FIG. 4), wherein the height h = 200 mm., the thickness at all locations t = 3 mm., the length of both flanges including the web thickness of 3 mm each amounts to b_1 = 50 mm., and therefore the total width of the Z-shaped profile $B_z = 2 \times b_1 - t = 2 \times 50$ mm − 3 mm = 97 mm, and if the width B_s of the support slot s is for instance chosen to be 56 millimeters, so that the total width of the new and improved inventive form support ST amounts to $B = 2 \times B_z + B_s = 2 \times 97$ mm + 56 mm = 250 mm, since in the case of the inventive form supports ST the mutual center-to-center spacing Al_m is composed of the free length l_o = 50 cm and half the width of both neighboring supports ST, each of which amounts to ½ B = ½ × 250 mm = 125 mm = 12.5 cm, within the associated mass chain 50 cm + 2 × 12.5 cm = 75 cm.

Now in FIG. 1B there are illustrated two conventional form supports ST'', again composed of I-shaped profiles but having greater dimensions than the supports ST' in FIG. 1. The form supports ST'' have the same mutual center-to-center spacing Al_m, for instance equal to 75 centimeters as was the case for the inventive adjacently arranged form supports ST illustrated thereabove in FIG. 1. However, in the case of both of the form supports ST'' the free length l_o'' determined by the mutual spacing of the flange edges K'' is considerably greater than the free length l_o for the inventive supports ST illustrated thereabove in FIG. 1. This is so because in this case the half width of both neighboring supports ST'', which enter into the free length l_o'', notwithstanding the greater dimensions of the I-shaped supports ST'', is smaller than is the case with the inventive supports ST and, for instance, only each amount to 5 centimeters so that here the free length $l_o'' = Al_m - 2 \times ½ b'' = 75$ cm − 2 × 5 cm = 65 cm, which however, in consideration of the bending through of the form sheathing SH which arises, and has been designated at the bottom of FIG. 1 by the phanton line DB, is too large. Although with the novel support system, shown in FIG. 1A, the permissible free length l_o leads to a mutual center-to-center spacing Al_m of the momentarily neighboring supports ST, which is greater than the mutual center-to-center spacing A_m of the momentarily neighboring supports ST' of the conventional constructions for the same permissible free length l_o, as depicted in FIG. 1, conventional supports ST'', as shown in FIG. 1B, if such are arranged next to one another with the same mutual center-to-center spacing Al_m as permitted for the inventive supports ST for the permissible free length l_o, notwithstanding the larger selected dimensions result in too large a free spacing of the momentarily neighboring supports ST'', that is to say too large a free length l_o'', resulting in impermissible bending through of the form sheathing SH between the supports ST'.

As also can be recognised by further considering FIG. 1A, further aspect of the new and improved two-component support ST can be seen to reside in the fact that the constructional height for the inventive support ST, in comparison to conventional supports employing I-shaped profiles, for the same load (Kg) and loading (kg/cm²) is less. This is so because the inventive support ST in contrast to the conventional supports consisting of a respective I-shaped profile, is formed of two Z-shaped profiles, that is to say, two webs 1st as well as two front flanges 1' and two rear flanges 1''. A conventional form support constructed of I-shaped carriers in order to have the same moment of resistance of the cross-section (W in cm³) as for the novel inventive form support ST must possess a considerably greater height. Yet in concrete formwork it is desirable if the constructional height of the form support can be maintained as small as possible.

Turning now to FIG. 2, there is illustrated therein a form of formwork support ST_u designed according to the teachings of the present invention which consists of two respective differently flanged Z-shaped profiles $1z_u$, with both longer flanges 1'' being arranged at the rear of the support ST_u and confronting one another. If in this case there is chosen two commercially available Z-shaped profiles $1z_u$ with the dimensions 200/55/40/5, wherein the height amounts to 200 millimeters, the thickness at all locations t = 3 mm, the length of the longer flange including the web thickness of 5 millimeters having the value b_1 = 55 mm, the length of the shorter flange including the web thickness of 5 millimeters having the value b_2 = 40 mm, and the total width of the Z-shaped profile $B_z = b_1 + b_2 - t =$ 55 mm + 40 mm − 5 mm = 90 mm (*cf* the left of FIG.

4), then, for a width $B_s = 70$ mm for the support slot *s* the total width of the form support ST_u amounts to $B = 2 \times B_z + B_s = 2 \times 90$ mm $+ 70$ mm $= 250$ mm $= 25$ cm, the likewise, as for the novel form support ST, shown FIG. 1A, composed of the similar flange Z-shaped profiles 200/50/3, with free length $1_o = 50$ cm the mutual center-to-center spacing $A1_m = 1_o$ plus one half of the support width B to the left and to the right respectively, there results 50 cm + 2 × 12.5 cm = 75 cm.

The form support ST_u illustrated in FIG. 3 is composed of the same dissimilar flanged Z-shaped profile elements as the support ST_u of FIG. 2. However in this case both of the longer flanges 1'u are arranged at the front of the support ST_u and diverge. As a comparison of both FIGS. 2 and 3 will immediately make clear, for this form support ST_u there results for the same total width B of the support as for the form support ST_u of FIG. 2 also the same slot width B_s, however with the support of FIG. 3 both profile webs $1st_u$ are arranged closer to one another than for the arrangement of FIG. 2. Since, as will be more fully explained hereinafter, for the new and improved support system of this development there are advantageously provided support extensions TV, as best seen by referring to FIGS. 8 to 12, and formed of two respective mutually spaced hollow profile elements, which can be inserted from the front into the form support ST or ST_u respectively, it would be advantageous in this case to select the arrangement of the unequal flanged Z-shaped profiles for the form support ST_u as shown in the arrangement of FIG. 2, where both profile webs $1st_u$ are spaced further from one another than for the support of FIG. 3 so that also a support extension TV of larger total cross-section and composed of two hollow profiles will also have place within the form support ST_u.

At the left of FIG. 4 there is illustrated a dissimilar or unequal flange Z-shaped profile $1z_u$ and at the right thereof a similarly flanged Z-shaped profile 1z for the form or formwork supports ST_u and ST respectively, each in a front view. If, for instance, there is selected for the unequal or dissimilar flanged Z-shaped profile $1z_u$ a commercially available cold profile element formed of steel 200/55/5, then, the total width of this Z-shaped profile assumes the value $B_z = b_1 + b_2 - t =$ 55 mm + 40 mm − 5 mm = 90 mm. If there is selected for the similar flanged Z-shaped profile 1z, for instance, commercially available cold profile formed of steel 200/50/50/3, then, the total width of this Z-shaped profile will be seen to assume the value $B_z = b_1 + b_1 - t =$ 50 mm + 50 mm − 3 mm = 97 mm.

In FIG. 5 there is shown a girder L which has been clamped to a wall form support ST through the agency of a support clamp TK constructed as a screw clamp. The girder L consists of two similar Z-shaped profiles L_z which are spaced from one another over their entire length and extend parallel to one another and have dissimilar or unequal flanges. Further, these two Z-shaped profiles L_z are fixedly connected with one another by at least two connection brackets L_a which are spaced from one another at a relatively great distance and which are attached, such as by welding, with the rear located shorter flanges 1'', as shown. The advantages of such type girders L have been more fully explained in the aforementioned United States patent application, Ser. No. 108,771 to which reference may be readily had.

According to the illustration shown in FIGS. 6 and 7 the support or carrier clamp TK consists of a quadratic, such as a rectangular head plate 2, an anchor or bolt 2*a* provided with external threading and welded to the head plate 2, a quadratic, again for instance a rectangular counter plate 2*g* which is loosely slipped onto this anchor 2*a*, and a threaded nut member 2*m*. The support clamp TK is inserted from the front of the form support ST into the latter perpendicularly through the support slot s, as such has been represented by the directional arrow R_2 of FIG. 6.

Furthermore, as best seen by also referring to FIGS. 6 and 7 the traverses or crosstie rods 1*a* of the form support ST consist of iron angle members having unequal size legs, wherein the shorter leg arranged at the loaded side serves to take-up a support ledge TL consisting of wood and which can be threadably connected by head screws KS to the iron angle members and possess such a height that their free surface aligns exactly with the load surface BF of the form support ST. The form sheath SH is secured by means of nails N to the support ledge TL. The girder L leaves sufficient space free at its rear in order to be able to mount the counter plate 2*g* upon the anchor 2*a* and to tighten the threaded nut 2*m*.

In FIG. 8 a support extension TV is inserted from the end of a wall form support ST into such and clamped through the agency of a coupling clamp KK constructed as a screw clamp with the form support ST. The support extension TV consists of two similar hollow profile elements 3 which are spaced from one another and parallel to one another and interconnected with one another by the webs 3*a*, the hollow profile elements 3 possessing rectangular cross-section and equipped with welded spacer elements 4*d*, as best seen by referring to FIG. 9.

The coupling clamp KK consists of a rectangular head plate 4, an anchor or bolt 4*a* equipped with external threading and welded with the head plate 4, a rectangular counter plate 4*g* inserted onto the anchor 4*a*, and a threaded nut r*m*, all as best seen by referring to FIGS. 8 and 9. The coupling clamp KK is introduced from the rear of the wall form support ST into 4*through the support slot s*, as such is represented in FIG. 9 by the directional arrow R_4. The width of the head plate 4 as well as the diameter of the anchor 4*a* are smaller than the width of the support slot *s* and the mutual spacing of both spaced hollow profiles 3 of the support extension TV. Although the length of the head plate 4 is greater than the mutual spacing of both webs 3*a* of the support extension TV (FIG. 8), nonetheless the coupling clamp KK can also be inserted into the support extension TV in such a manner that the head plate 4 covers the ends of both webs 3*a* and thus forms a countersupport. This namely is achieved in that upon insertion of the coupling clamp KK into the form support ST and thereafter the support extension TV in the direction of the arrow R_4 the coupling clamp KK is introduced in an inclined position so that the head plate 4 initially only comes to bear with its end upon one of those webs 3*a*, whereafter through appropriate pivoting of the coupling clamp KK also the other end of the head plate 4 comes to bear upon the other web 3*a*. This tilting movement of the coupling clamp KK is therefore easily possible because the continuous support slot *s* and the hollow space extending parallel to such be-

tween both hollow profile elements 3 of the support extension TV provides sufficient play for this purpose.

The height of the distance or spacer element 4*d* welded to the support extension TV is dimensioned such that both hollow profiles 3 of the inserted support extension TV at its loaded side come into alignment with the load surface BF of the form support ST so that the form sheathing SH can also bear against the support extension TV. If the screw nut 4*m* which has been threaded onto the anchor 4*a* is tightened the thus rearwardly drawn head plate 4 presses against both webs 3*a* of the support extension TV and thereby draws this support extension TV towards the rear. In so doing the support extension TV fixedly bears with both of the spacer elements 4*d* welded thereto against the inner surfaces of the flanges of both Z-shaped profiles of the form support ST. Consequently, the support extension TV is simultaneously fixedly clamped at four locations against the form support ST, namely between both ends of the head plate 4 and the forward front surfaces of both webs 3*a* of the support extension TV on the one hand as well the rear front surfaces of both distance or spacer elements 4*d* welded thereto and the inner surfaces of the flanges of both Z-shaped profiles of the form support ST on the other hand. Owing to the exact calculated height of both spacer elements 4*d* the front surface of the support extension TV comes to lie exactly in the plane of the front load surface BF of the form support ST.

FIG. 10 illustrates a support extension TV utilized as a coupling for two superimposed arranged wall form supports ST_1 and ST_2. In this case the support extension is fixedly clamped with a respective coupling clamp KK_1 and KK_2 at the lower form support ST_1 and upper form support ST_2 respectively. Instead of using one support extension TV there can also be used an appropriately shorter support coupling TKu, as such has been shown in chain-dot lines in FIG. 10.

FIG. 11 illustrates a ceiling form support ST which can be extended towards the right by means of a support extension TV which has been inserted therein and a coupling clamp KK. FIG. 12 illustrates the manner in which two ceiling form supports ST_1 and ST_2 can be fixedly connected with one another through the agency of a support extension TV simultaneously functioning as a coupling and two coupling clamps KK_1 and KK_2.

FIG. 13 illustrates a support clamp TK', deviating from the showing of FIGS. 5 to 7, and serving for attachment of the girder L to the form support ST. This support clamp TK' ensures for a particularly exact right-angle, and at the same time also a particularly rigid, connection between the girders L consisting in this case of Z-shaped profiles, and the form supports ST. Furthermore, this support clamp TK', by virtue of its finely stepped angular adjustability renders possible practically every inclination of the girder L with respect to the form support ST and vice versa, whereby also there is ensured the desired inclination angle between the girder L and the form support ST as well as the rigidity of their connection.

As best seen by referring to FIG. 13 the support clamp TK' essentially consists of a rectangular head plate 2' with a star-shaped extension or shoulder 2'*st* and an anchor or bolt 2'*a* equipped with external threading, a rectangular counter plate 2'*g* with a star-shaped throughpassage opening 2'*gst*, a support disc 2'*u* and a threaded or screw nut 2'*m*.

The head plate 2' and the counter plate 2'*g* each possess at their central region a respective continuous ledge-shaped shoulder or ridge A_k and A_g, the width of which exactly corresponds to the width of the slots s_t and s_1 of the form support ST and the girder L respectively. Further, the front surfaces f_k and f_g of the head plate 2' and counter plate $2'_g$ which extend parallel to the inner web surfaces of the form support ST and the girder L are considerably spaced from such web surfaces. Hence, the head plate 2' and counter plate $2'_g$ fit by means of the central ledge-shaped shoulders A_k and A_g, and specifically only by means of such shoulders, in a form-locking fashion into the longitudinal slots s_t and s_1 of the form support ST and girder L respectively.

The substantially star-shaped projection or extension 2'*st* of the head plate 2', which in the embodiment under consideration possesses 12 teeth for instance, fits in a form-locking fashion into the complimentary star-shaped throughpassage opening 2'*gst* of the counter plate 2'*g*, throughpassage opening 2'*gst* possessing 12 tooth gaps, and specifically in each of all possible 12 mutual rotational positions between the extension 2'*st* and the throughpassage opening 2'*gst*. As should be readily understood the 12 star teeth of the projection or extension 2'*st* in each case fit into the 12 tooth gaps of the star-shaped through-passage opening 2'*gst*.

Since the head plate 2'is connected in form-locking fashion with the form support ST, and furthermore, since the counter plate 2'*g* is connected in form-locking fashion with the girder L, and moreover, inasmuch as the counter plate 2'*g* can be fitted in form-locking fashion at the star-shaped projection 2'*st* of the head plate 2', after establishing the connection between the head plate 2' and the counter plate 2'*g* there also prevails an exact form-locking connection between the form support ST and the girder L ensuring for a rigid as well as also exact connection of both of these form elements and thereby precluding any undesired positional changes thereof relative to one another. This is also the case for each of the different angular positions between the girder L and the form support ST which can be established through possible mutual rotational positions of both clamping plates 2' and 2'*g*.

As clearly seen by referring to FIG. 13 the height of both ledge-shaped shoulders or projections A_k and A_g of the head plate 2' and the counter plate 2'*g*, respectively, is somewhat smaller than the thickness of the flanges of both Z-shaped profiles of the form support ST and the girder L. As a result there is ensured that during establishment of the connection between the form support ST and the girder L the outer surfaces of the flanges will directly bear snugly against one another (see also FIG. 14), that is to say, not merely only the confronting surfaces of only the central portions of the intersecting rectangular shoulders A_k and A_g, which would provide a considerably smaller effective impact- and bearing surface.

The portion of the star-shaped shoulder or projection 2'*st* of the head plate 2' which extends past the plane of the outside surfaces of the support flanges possesses a smaller height than the sum of the thicknesses of the girder flange and the outer portion of the counter plate 2'*g* bearing thereagainst. In this way it is ensured that the threaded nut member 2'*m*, upon being tightened

upon the anchor 2'*a*, while placing therebetween the support disc 2'*u*, will come to bear against the counter plate 2'*g*, that is, not merely only at the front surface of the star-shaped shoulder 2'*st* of the head plate 2', resulting in an axial play with respect to the axis of the anchor 2'*a* between the girder L and the form support ST, in other words would prevent a force-locking mutual contact of both of these form elements against one another at their outer flange surfaces which is free of play.

The head plate 2' bears with both of its outer portions against the inner flange surfaces of the form support ST and the counter plate 2'*g* bears directly by means of both of its outer portions against the inner flange surfaces of the girder L, as clearly seen by referring to FIG. 13.

FIG. 14 illustrates in cross-section the form support ST and the girder L together with the support clamp TK' serving for their mutual interconnection. It will be clearly recognised that after establishing the connection only the flange outer surfaces of the girder L and the form support ST bear against one another and that the threaded or screw nut 2'*m*, while interposing the support disc 2'*u*, can only bear against the rear surface of the counter plate 2'*g* and therefore absolutely free of play with regard to the axis of the anchor 2'*a* because a force-locking connection prevails between the girder L and the form support ST. Furthermore, the noteworthy simple construction of the support clamp TK' will be recognised from FIG. 14.

FIG. 15 illustrates in perspective view the head plate 2' of the support clamp TK'. The head plate 2', as is also the case for the counter plate 2'*g*, can be for instance a cast member or a drop-forged component which in consideration of the present day machining techniques which are available can be fabricated with sufficient accuracy. The anchor 2'*a* of the head plate 2' can be, for instance, cast or forged thereat.

FIG. 16 illustrates a bracing wall form for a downwardly sloping or descending street. In this case the form supports ST are arranged vertically in the usual way, whereas both girders L, corresponding to the gradient of the road or street, are inclined at a certain angle of inclination out of the horizontal, in other words, they do not extend perpendicular to the extent of the form supports ST as would be the case for a normal or standard arrangement. By virtue of the previously described support clamp TK' it is possible to exactly adjust this inclination of the girders L with respect to the form supports ST, whereby additionally there is guaranteed under all circumstances the exact maintenance of the angle of inclination between both of these elements owing to their mutual form-locking and therefore rigid connection.

FIG. 17 illustrates a standard wall form, by which however, as such situation arises in practice, the last form support ST_e should possess a certain inclined position with respect to the vertical for given reasons. Also this inclination of the terminal or end form support with respect to the horizontally extending girders L can be completely ensureed for by virtue of the previously described support clamp TK' and furthermore with the desired accuracy and rigidity of the interconnection between the supports ST and the girders L.

It is to be understood that FIGS. 16 and 17 only depict two examples for certain inclinations between the form supports ST and the girders L. These type situations frequently arise in engineering construction work, especially underground building and in many different variations, and they can be coped with in optimum manner by virtue of the previously described support clamps TK'. Instead of only inclining the girders L with respect to the form supports ST or inclining the form supports ST with respect to the girders L it is in fact possible to incline both such elements, that is, the form supports ST and the girders L with respect to the main directions of the form disposed perpendicular to one another, and additionally, owing to the special construction of the support clamps TK' to rigidly interconnect these elements with one another and in the exact desired angular position.

FIG. 18 schematically illustrates the ribbing or framework of a form, wherein the form supports ST and the girders L have only been schematically represented by the broken central or middle axis line and their points of interconnection only by the small circles designated by the reference character V. If in this case there are employed support clamps TK' of the type previously discussed then there is afforded a rigid, exact rectangular, but at the same time also angularly adjustable form framework, and specifically also then if there are not employed at all of the connection locations V such form-locking support clamps TK'. For instance, at both horizontal rows of connection locations V there are alternately employed form-locking support clamps TK' and simple support clamps TK, as such has been illustrated in FIGS. 5 to 7.

If there are required support clamps which are particularly rigid and also angularly exact for right-angle connections, but need not possess the feature of affording an angular adjustability for the inclined position of the girders L and supports ST, then it would be possible for such purpose to further simplify the previously described support clamps TK' in that the star-shaped projection 2'*st* of the head plate 2' need only be constructed in the form of a square or quadratic or rectangular projection which can be provided at the head plate, as for instance by being forged or cast thereat. In such case the counter plate 2'*g*, instead of being provided with the star-shaped throughpassage opening 2'*gst* as previously discussed, would then be equipped with an appropriate square, quadratic or rectangular throughpassage opening. In this way there would also be ensured for an exact, form-locking and therefore rigid connection between the head plate 2' and the counter plate 2'*g* and thus between the form supports ST and the girders L.

Instead of providing the head plate 2' with a star-shaped or quadratic shoulder or projection 2'*st* and the counter plate 2'*g* with a star-shaped or quadratic throughpassage opening 2'*gst*, it would be possible to reverse the arrangement in that the head plate 2' would then be provided with the star-shaped or square or rectangular or quadratic throughpassage opening and the counter plate 2'*g* would then be provided with the correspondingly configured star-shaped or rectangular or quadratic or square projection. In such case the anchor 2'*a*, instead of being arranged at the head plate 2', then would be arranged at the counter plate 2'*g*.

Instead of using the anchor 2'*a* provided with external threading and the associated threaded or screw nut 2'*m* it would also be possible to use a smooth pin having extending transversely therethrough a flat wedge or a rotary wedge connection.

Instead of the girders L consisting of Z-shaped profiles such could also be formed of unequal leg U-shaped profiles as such has been illustrated and described in my aforementioned copending United States patent application, Ser. No. 108,771.

In any case, similar to the support clamp TK of FIGS. 5 to 7, the previously discussed support clamp TK' guarantees for an infinite adjustability between the girders L and the form supports ST in both main directions of the form which are perpendicular to one another, that is for a wall form for the form support ST an absolute infinite adjustability in the vertical direction. This is also true for the additional angular adjustability between the girders L and the form supports ST. This is so because the support clamp TK', depending upon the teeth sub-division and the number of teeth selected for its star-shaped projection 2'*st* affords a more or less fine, that is, practically infinite exact angular adjustability between the girders L and the form supports ST while always establishing a form-locking i.e., rigid connection of both of these form elements and in every angular position thereof. Consequently, the support clamp TK' provides the decisive advantage of optimum universality of the adjustment with optimum rigidity and accuracy of the interconnection between the form supports and the girders.

The previously described support system for concrete forms, while maintaining the permissible free spacing, the so called "free length" between two neighboring form supports, has the advantage over the previously known prior art systems of this type that it renders possible a greater center-to-center spacing between each two neighboring form supports with a lower height of the supports than previously possible. Therefore there is provided a considerable reduction in the expenditure of material, in other words, a reduction in the manufacturing costs and the weight of the form supports, as well as also a corresponding reduction in the work time required during mounting and dismantling thereof and also providing a considerably improved accommodation to the momentarily encountered construction conditions and requirements.

It is a further aspect of this invention to construct the support system for concrete forms in such a manner that the expenditure of material and the price and weight of the form supports as well as also the work time required for mounting and dismantling thereof can be further reduced without any appreciable impairment of its load supporting capability. This renders possible the economical utilization of form supports of greater dimension than previously was the case.

A number of exemplary embodiments of inventive support systems which fulfill this further aspect of this invention have been shown in FIGS. 19 to 23 will now be explained on the basis thereof.

Now in FIG. 19 there is illustrated a form support ST_1 constructed in the manner of a honeycombed support and formed of two similar, equal leg Z-shaped profile elements 1*a*. These Z-shaped profile elements 1z are spaced from one another and interconnected with one another by means of traverses or crosstie rods 1*a*, only one of which has been illustrated in FIG. 19, these crosstie rods or traverses being mounted, for instance welded to, the profile webs 1st of these Z-shaped profile elements 1z. At both end portions of the form support ST_1 a respective traverse or crosstie rod 1a is spaced from the terminal or end front face of the support in such a manner that both support clamps for fixedly clamping the girders to the form supports as well as coupling clamps for fixedly clamping support extensions which are introduced from the end side of the form support ST_1 can be arranged without obstruction at the terminal portions of the form supports ST_1, as such has been illustrated and previously described in conjunction with FIGS. 6, 7, 13 and 14 and 8 to 12.

Each of the equal leg Z-shaped profiles 1z of the form support ST_1 is fabricated as a honeycombed support in such a manner that a standard equal leg Z-shaped profile is cut along a sawtooth-shaped line at the region of its null or center line at the web 1st along the length of such Z-shaped profile. Then both of the halves of the Z-shaped profile are drawn apart in order to obtain a tooth division in the lengthwise direction which is mutually offset. Thereafter the web teeth Z of both profile halves which are situated opposite one another are welded together along the welding seam SN. As a result both Z-shaped profiles 1z have provided thereat substantially rhombus-shaped openings D_1, and the height of the web 1st of the Z-shaped profile 1z which has been finished manufactured as a honeycombed cell support is greater than the height of the conventional Z-shaped profile used for manufacturing same. Hence with the same expenditure of material —since there is no waste during this mode of manufacture—there is afforded a greater static moment of resistance and therefore a greater load supporting capability for the finished Z-shaped profile 1z, as is also obtained for the form support ST_1.

In FIG. 20 a form support ST_2 constructed as a honeycombed support is likewise assembled from two similar equal leg Z-shaped profiles 1st, whereby however each of these is formed from two similar unequal leg iron angle members WE. Both of these iron angle members WE are welded to one another along the welding seam SN. At the sections of the web 1st arranged at spaced relationship along the lengthwise edges, of the finished welded Z-shaped profile 1z, and specifically at the region of the center or neutral line of the form support ST_2 there are formed window-like openings D_2 and thus results in an appropriate reduction in weight for the finished form support ST_2. It is to be observed that when forming the openings or windows D_2 as indicated in FIG. 20, both Z-shaped profiles and therefore the form support ST cannot be produced by cutting the web of a standard Z-shaped profile along a sawtooth-shaped line and the neutral or central line of the Z-profile 1st, as such was the case when previously discussing FIG. 19, because there is not present any sawtooth line which is common for both Z-profile halves, which when connecting together both Z-profile halves will produce the configuration of the windows or openings D_2 as shown in FIG. 20 wherein the openings D_2 have an eight-sided or octagonal form in contrast to the simpler six-sided or hexagonal form of the openings D_1 of FIG. 19. Both Z-shaped profiles 1st are again interconnected with one another in the arrangement of FIG. 20 by suitable crosstie rods or traverses, which here have been conveniently omitted, but can be seen by referring to element 1*a* of FIG. 19 for instance.

In FIG. 21 a form support ST_3 is constructed as a grid support, wherein its both unequal leg Z-shaped profiles $1z_u$ are each produced from a respective equal leg iron angle member WE and an unequal leg iron angle member WE_u, which are spaced from one another and inter-

connected with one another by grid struts or straps G_{str} in such a manner that there are formed substantially triangular support openings or windows D_3. A transverse or crosstie rod 1a which spaces both Z-shaped profiles $1z_u$ from one another and interconnects such with one another has been illustrated in FIG. 21. The unequal leg iron angle members WE_u are arranged at the load side of the from support ST_3 in such a manner that their longer legs extend in opposite directions, increasing the support width of the form support ST_3 for the form sheathing and thereby, while maintaining the permissible free length, also rendering possible a greater center-to-center spacing between each two neighboring form supports ST_3.

In FIG. 22 there is illustrated a form support ST_4 which is composed of two similar, unequal leg Z-shaped profiles $1z_u$. These Z-profiles possess undulated or wavy-configured webs $1st_w$ provided with oval openings D_4. Here also a traverse or crosstie member 1a spaces and connects both Z-profiles $1z_u$ with one another at the region of the terminal portions of the form support ST_4. At the center as well as at the other terminal portion of the form support ST_4 there are likewise arranged traverses 1*a*, which however are not visible in the showing of FIG. 22 since the form support ST_4 has been shown in fragmentary view. It is to be mentioned that the same is also the case for the form supports of FIGS. 19 to 21 and 23. Also for the form support ST_4 of FIG. 22 the longer legs or flanges of both unequal leg Z-profiles $1z_u$ are arranged at the load side of the form support ST_4, whereby here also they extend in opposite direction, providing for a greater center-to-center distance or spacing between each two neighboring form supports ST_4, as such has previously been explained in conjunction with the embodiment of FIG. 21.

In FIG. 23 there is illustrated a form support ST_5 which is composed of two similar unequal leg Z-shaped profiles $1z_u$, the webs 1st thereof diverge towards the load side of the support ST_5, that is in the direction of the form sheathing indicated by reference character SH. The angle of inclination of both webs 1st are equal to one another. In this case, on the one hand owing to the mutual spacing of both Z-profiles $1z_u$ and, on the other hand, by virtue of the larger flanges of both unequal leg Z-profiles $1z_u$ arranged at the load side of the form support ST_5 there is provided a considerably greater contact or bearing width of the form support ST_5 and the thus obtained appropriately greater center-to-center spacing of each two neighboring form supports ST_5 is even further increased by virtue of the diverging profile webs 1st. As a result, while maintaining the permissible free bearing or contact spacing between each two neighboring form supports ST_5, that is, the permissible so-called "free length," the center-to-center spacing of neighboring form supports ST_5 for the concrete form which is to be erected can be chosen to be appropriately still larger, that is, the material and work expenditure can be further appropriately reduced.

The web openings or windows have been designated in FIG. 23 by reference character D_5, whereas the traverses are again indicated by reference character 1*a*. The web openings D_5 contribute towards a reduction in the weight of the support, therefore facilitating mounting and dismantling of the form and reducing the work time needed for these operations.

By virtue of the embodiments of form supports as discussed above in conjunction with FIGS. 19 to 23 the expenditure of material and therefore the price and weight of the form supports, as well as also the working time for mounting and dismantling thereof, without any appreciable impairment of their load carrying capability, are considerably reduced, again rendering possible a more economical utilization of form supports of greater dimensions than was heretofore the case.

The proposed support systems for concrete forms as contemplated by the invention possess the advantage, that while maintaining the permissible free spacing, that is the so-called free length 1_o, between each two neighboring form supports, the center-to-center spacing between the form supports can be considerably greater than previously could be chosen so that, on the one hand, the expenditure of material for the form and, on the other hand, also the work time for mounting and dismantling, can be essentially reduced. Additionally with the novel systems of this invention there reside the further advantage that the construction height of the form supports for the same load and loading as for the conventional prior art form supports, can be smaller than for the conventional form support constructions. This is of course a welcome feature of this development in concrete formwork where oftentimes the space available for work is considerably limited. Moreover, the novel support systems as proposed herein, owing to the support clamps constructed as screw clamps and serving for the connection of the girders as well as the provision of the coupling clamps for the support extensions and support couplings, advantageously permit a rapid and ready accommodation to the conditions encountered in the construction work. This is so because owing to such screw clamps in conjunction with the continuous support slots which extend over the entire length of the form support there is possible an infinite variable clamping position of the elements which are to be fixedly clamped with the support, that is, the girders, support extensions and support couplings, and further there is rendered possible an infinite adjustability of the form in the main horizontal and vertical directions. Additionally, the novel support systems disclosed herein can be combined in a very simple manner with the advantageous construction of girder system described in my United States patent application, Ser. No. 108,771, which girder system likewise provides an infinite adjustability in both main directions of the form, so that in totality there is provided a maximum or optimum accommodation possibility of the new support systems.

Further, the special construction of the support clamps with the form-locking connection of both their clamping plates via a star-shaped projection allows for an exact angular adjustment between the girders and the form supports while affording a rigid connection of both of these form elements which is free of play.

Apart from the various embodiments of support systems disclosed herein also individual components thereof are considered to be novel.

It is to be observed and easily recognisable that the support clamps TK′ with the form-locking connection of the form supports and girders of the type illustrated in FIGS. 13 to 15, owing to their great rigidity and practically infinite adjustability have special significance, whereas the support clamps illustrated in the embodiments of FIGS. 5 to 7 manifest themselves by virtue of their particular simplicity.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims. Accordingly,

What is claimed is:

1. In combination a support system for concrete forms and concrete forms having form sheathing, comprising form support means, at least one girder provided for said form support means, each said form support means comprising two similar and parallelly extending substantially Z-shaped profile elements arranged in spaced relationship from one another, said pair of Z-shaped profile elements providing profile web means and a pair of confronting flanges and a pair of oppositely directed flanges, traverse means applied to said profile web means for maintaining said Z-shaped profile elements spaced from one another and arranged in such a fashion with respect to the form sheathing that their oppositely directed flanges come to lie at the load side of the form support means at the side of the form sheathing and their confronting flanges at the side of the girder leave free between themselves a slot which is continuous and extends over the entire length of the form support means, support clamp means for fixedly clamping the girder with the form support means, said support clamp means being introduced from the front of the associated form support means into such essentially perpendicular thereto and through the slot thereof, at least one support extension, and coupling clamp means for fixedly clamping the support extension introduced into a form support means with such form support means, said coupling clamp means being introduced from the rear of said form support means into such and through the slot thereof.

2. A support system as defined in claim **1,** wherein said support clamp means which can be inserted from the front of the associated form support means into such comprises a head plate, an anchor provided with external threading fixedly mounted to said head plate, a counter plate loosely insertable upon said anchor and a threaded nut member, and wherein the diameter of said anchor is smaller than the width of said slot.

3. The support system as defined in claim **1,** wherein said support extension comprises two essentially similar spaced profiles which are substantially parallel to one another, webs for interconnecting said profiles with one another, spacer elements fixedly mounted to said profiles, and wherein the width of the total cross-section area of the support extension is smaller than the mutual spacing of said web means of both Z-shaped profile elements of each said form support means.

4. The support system as defined in claim **3,** wherein said profiles of said support extension are formed of hollow profile members possessing substantially rectangular cross-sectional configuration.

5. The support system as defined in claim **3,** wherein said coupling clamp means which can be inserted from the rear of the associated form support means comprises a head plate, an anchor equipped with external threading fixedly mounted at said head plate, a counter plate which can be inserted onto said anchor, and a threaded nut member, and wherein the diameter of the anchor as well as the width of the head plate are smaller than the width of the slot and the mutual spacing of both profiles of the support extension.

6. The support system as defined in claim **1,** wherein each said form support means comprises two substantially Z-shaped profile elements having different flanges.

7. The support system as defined in claim **1,** wherein each said form support means comprises two similar flanged Z-shaped profile elements.

8. The support system as defined in claim **1,** wherein said traverse means of said form support means comprises iron angle members having one leg provided with a threaded bore for accommodating a wooden support ledge for the form sheathing.

9. The support system as defined in claim **1,** wherein said girder has flanges, said support clamp means comprises two clamping plate means which can be connected both with one another as well as also with said form support means and said girder in a form-locking fashion, one of said clamping plates having a substantially central plug-shaped extension serving to receive a detachable connection element by means of which both clamping plates can be connected in a form-locking and relatively non-rotatable fashion with one another directly at the inner surface of the flanges of the form support means and the girder and wherein the outer surface of the flanges are maintained in mutual contact.

10. The support system as defined in claim **9,** wherein one of said two clamping plate means is constructed as a substantially rectangular head plate and is provided with a projection means for carrying out a mutual angular adjustability between the form support means and said girder, and wherein the other of said clamping plate means is constructed as a substantially rectangular counter plate provided with a throughpassage opening.

11. The support system as defined in claim **10,** wherein said projection means is of substantially star-shaped configuration and wherein said throughpassage opening is similarly of complementary star-shaped configuration.

12. The support system as defined in claim **10,** wherein said projection is of substantially quadratic configuration and wherein said throughpassage opening is also of substantially quadratic configuration.

13. The support system as defined in claim **10,** wherein said girder is provided with a slot, both clamping plate means each have a central continuous ledge-shaped projection of a width essentially corresponding to the width of the slots of the form support means and said girder and are only form-lockingly connected via such projections with the form support means and said girder, and wherein said projections adjoin one another.

14. The support system as defined in claim **1,** wherein said web means of both Z-shaped profile elements of each form support means at the region of its neutral line is provided with openings.

15. The support system as defined in claim **14,** wherein each of both Z-shaped profile elements comprises a honeycombed support.

16. The support system as defined in claim **14,** wherein each of both Z-shaped profile elements comprises a grid support arrangement.

17. The support system as defined in claim **14,** wherein each of both Z-shaped profile elements is provided with an undulated web portion.

18. The support system as defined in claim 1, wherein the web means of both Z-shaped profile elements are inclined with respect to one another.

19. The support system as defined in claim 18, wherein the web means are inclined at the same angle and extend in a diverging direction with respect to the load side of the form support means.

20. In combination a support system for concrete forms and concrete forms having form sheathing, comprising at least one form support means having a load side and at least one girder for reinforcing said form support means at a side opposite said load side, said form support means comprising a pair of substantially parallelly extending and substantially Z-shaped profile elements arranged in spaced relationship from one another, said pair of Z-shaped profile elements providing a pair of oppositely directed flanges and a pair of confronting flanges, means for maintaining said Z-shaped profile elements spaced from one another and disposed in such a fashion with respect to the form sheathing that said oppositely directed flanges come to lie at the load side of the form support means at the side of the form sheathing and said flanges which confront one another are disposed at the girder side and leave free therebetween a slot which extends essentially over the entire length of said form support means, and support clamp means for fixedly clamping the girder with the form support means, said support clamp means being introduced into said form support means substantially perpendicular thereto and through the slot thereof.

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