

FORMWORK SUPPORTING SYSTEM



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FIELD OF THE INVENTION

- 5 The present invention relates to a formwork supporting system for building construction. More particularly, the present invention relates to a formwork supporting system which provides efficiency in installation and extrication of formwork in situ.

BACKGROUND ART

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- As cranes are usually fully occupied it is always necessary to consider other means of easing the burden on them by using other mobile plant for the movement of formwork. Since column and wall formwork are normally transferred from one use to the next without too much trouble, the principal reason for the use of a mobile plant is in moving
15 the floor and beam formwork. Thus, it is advantageous to use formwork support system that could reduce the time lost in waiting for availability of a crane.

- Since beam and floor formworks can not be lifted out vertically from under the floor, it must be first lowered and then transported either to a new position on the same floor or
20 lifted by manpower to a new position on the next floor. In a building with large floor areas, it may be found not practicable to use a fork-lift truck for this operation, but generally a formwork support system that is easier to assemble and mobile would be more favoured for this work.

- 25 An example of mobile plant for floor and beam formworks, which has been used and still in use now, is hydraulic platforms on wheels. This platform is normally constructed in steel with two frames, one above the other and joined with a scissor-operating mechanism which acts as the frame bracing structure. Furthermore, it allows the upper frame to be moved under the table formwork, and raised or lowered the table formwork
30 by hydraulic means. There is another version of this mobile plant which uses a ratchet device instead of hydraulic arms. This device can also be constructed so that it is telescopic in the length direction. The disadvantage with this type of platform is that it can only be used for table formwork when the supporting structure has been removed.



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If the supporting structures remain intact with the table formwork, a wheeled transport frame can be used. This frame is constructed in a way that it can be quickly and conveniently fitted to the supporting structure of a table formwork, one frame at each
5 end. After retraction of the feet to the supporting structure, the whole table with supports can easily be moved on the supporting structure wheels to the required position.

Besides that, there is also another type of mobile plant called mobile transporting wheels. These are simply wheels which have a quick-locking device for clamping to the
10 vertical element of the supporting structure and may be extended in height by the use of intermediate pieces. They can be raised or lowered either by means of ratchets or hydraulically and it can be fitted with a set of two smaller rollers for individual mobility.

Alternatively, a fixed transporting wheel can be used to replace the mobile wheel
15 mentioned previously. These fixed wheels remain on the supporting structure of the table formwork at each corner, so that the formwork unit is mobile at all times. The important feature here is that although the plant costs are a little higher, this is more than outweighed by the advantage of lesser labour costs in fitting the wheels and dismantling them with each use. Further, the formwork is more easily moved and corrected when
20 erecting and striking.

SUMMARY OF THE INVENTION

Accordingly, the present invention was created to overcome or minimize difficulties which occur in the construction and handling of floor and beam formwork. In the present invention, the formwork supporting system comprises supporting means to support a formwork, the supporting means having a support frame, a height-adjustable member, and height-adjusting means and transporting means. The height-adjustable member at the top hoists the formwork meanwhile the positioning of the height-adjustable member is manipulated by the height-adjusting means.

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The formwork support system is capable of efficiently supporting the elevation, dismantlement and thus reusability of the supported formwork. Utilization of the formwork supporting system retains the original condition of the supported formwork, therefore ensuring the formwork is reusable for the proceeding constructions. The formwork supporting system eases the transportation of the formwork prior and after a construction.

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A formwork supporting system further comprises a plurality of pivotable props mountable to the underneath of the formwork, the pivotable props each comprises of an upper prop, a lower prop, a foldable connector detachably mounted between the upper prop and the lower prop, and transporting means mounted to the foldable connector. The lower prop is capable of being pivoted and a locking pin can be unfastened to enable the lower prop to be folded upwards when necessary.

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In constructing a structural floor, the floor and beam formworks are designed and assembled as one unit. The floor and beam formworks are mountable on a plurality of fixed bases with the pivotable props being installed at the bottom thereof. Prior to the construction of a concrete structure, the platform of the formwork supporting system would be hoisted up to the soffit of the formwork by using height-adjusting means. After the completion of the construction, once the platform has firmly attached to the formwork, the pivotable props are loosen up and folded upwards. Next, the formwork supporting system would lower down the platform by slowly releasing the chain block.

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It is an object of the present invention to provide a formwork supporting system which comprises supporting means capable of temporarily hoisting the formwork before the pivotable props are unfolded into upright position.

- 5 It is another object of the present invention to provide a formwork supporting system that is capable of adjustably elevating and lowering the formwork.

- It is a final object of the present invention to provide pivotable props, that are installed beneath the formwork, foldable to transform said formwork to be transportable and can
10 be efficiently moved into other location.

- The present invention consists of certain novel features and a combination of parts hereinafter fully described and illustrated in the accompanying drawings and particularly pointed out in the appended claims; it being understood that various changes in the
15 details may be without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying drawings the preferred embodiments from an inspection of which
5 when considered in connection with the following description, the invention, its construction and operation and many of its advantages would be readily understood and appreciated.

Figure 1 is an elevation view of the present supporting means.

10 Figure 2a is another elevation view of the supporting means.

Figure 2b is an elevation view of the cross section of the height-adjustable member.

Figure 3 is an elevation view of the pivotable prop.

Figure 4 is an elevation view of the pivotable prop being rotated at the connector.

Figure 5 is a cross sectional view of the pivotable prop at the connector section.

15 Figure 6 is a side view of the pivotable prop.

Figure 7 is an elevation view of the pivotable prop.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to a formwork supporting system (100). More particularly, the present invention relates to a formwork supporting system (100) which provides
5 efficiency in installation and extrication of formwork in situ. Hereinafter, the formwork supporting system (100) shall be described according to the preferred embodiments of the present invention and by referring to the accompanying description and drawings. However, it is to be understood that limiting the description to the preferred
10 embodiments of the invention and to the drawings is merely to facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications without departing from the scope of the appended claim.

The present formwork supporting system (100) is known comprising of supporting means (90) to support the formwork and a plurality of pivotable props (95) mountable to
15 the underneath of the formwork for convenient transportation of the supported formwork.

Referring now to Figure 1 of the accompanying drawings, the supporting means (90) is shown comprising a support frame (10), a height-adjustable member, height-adjusting
20 means and transporting means. Provided on the support frame (10), is a retaining member, preferably a hollow shaft (35) vertically mounted at an intermediate position height-wise of the support frame (10). The hollow shaft (35) would function conveniently to retain the height-adjustable member.

25 As illustrated in Figures 1 and 2a, the height-adjustable member is provided in a series of telescopic posts (40). The telescopic posts (40) each are slidably connected to one another. Each of the posts (40) has different cross sections. To slidably connect all the telescopic posts (40), it would be essential that the cross sectional size of the bottommost telescopic post (40a) to have the largest size and the size gradually decreases to the
30 smallest size at the topmost telescopic post (40b). Therefore, it is to be understood that the telescopic post (40) disposed relatively at a upper position would have a relatively small cross sectional area and said telescopic post (40) would be telescopically received in the telescopic post (40) disposed relatively at lower position that has a relatively large

cross sectional area. The telescopic connection of the telescopic posts (40) in accordance to the description would inherently form an extensible shaft, that is capable of being slidably adjusted according to a preferred height. The telescopic post at the bottommost (40a) position having relatively small cross sectional area is telescopically received in a retaining manner into the hollow shaft (35) which has a relatively large cross sectional area. Further provided at the topmost telescopic post (40), is a platform (50) adapted as a holding structure for supporting the underneath of the supported formwork. The hollow shaft (35) is provided with a plurality of perforations (43) formed along the height-wise extent of the shaft (35) will be hereinafter described in greater detail. The telescopic posts (40) each are provided with a plurality of perforations (42) formed along the height-wise of the posts will be hereinafter described in greater detail.

The support frame (10) is conveniently equipped with height-adjusting means to adjust the platform (50) at a desired height. To achieve the height-adjusting function of the platform (50), a chain block (45) which acts as the height-adjusting means may be braced at the top portion (10b) of the support frame (10). Preferably the telescopic posts (40) each at the bottom portion are provided with attaching means (55) and a through bore (57) is formed thereon. The through bore (57) is formed essentially to be attached to the chain (47) of the chain block (45). The chain block (45) may be a hand operated hoisting appliance, whereby when the chain (47) is attached to the attaching means (55) of the corresponding telescopic post (40), the platform (50) can be hoisted upwards and downwards conveniently. In addition to that, with reference to Figure 2b, a passage (41) is essentially formed from the top end and terminates approximately at the bottom end of each of the telescopic posts (40) except the topmost telescopic post (40b) to accommodate the sliding of the attaching means (55) along the the sliding of the attaching means (55) of the relatively inner telescopic post (40) along the passage (41) of the relatively outer telescopic post (40).

To hoist the platform (50) in a upward direction, a user is required to firstly attach the chain (47) to the outermost telescopic post (40) through said through bore (57) and haul the chain (47) till the platform (50) is hoisted to a desired height. Provided further at the telescopic post (40), engaging means (not shown) preferably in the form of a pin or any other locking fastener is releasably secured through the perforation (42) formed on the

telescopic post (40) in which said locking fastener also secures through corresponding perforations (42 & 43) of the inner telescopic posts (40) and the perforation (43) of the hollow shaft (35) to lock the telescopic post (40) in position. The platform (50) height can be therefore adjusted according to the desired height and locked to the height by fastening the pin. If the first outermost telescopic post (40) is extended to its maximum height, the user could unfasten the locking fastener which locks the first telescopic post (40) and detach the chain (47) from the attaching means (55) of said first telescopic post (40), then attach said chain (47) to a second inner telescopic post (40) which is slidably connected to the first telescopic post (40). The user could haul the chain (47) again to further elevate the platform (50) and upon reaching the desired height, secure the fastener again in similar manner as aforementioned. Further elevation of the platform (50) may be performed using the same method as the subsequent telescopic posts (40). To hoist down the platform (50), the user must unlock the locking fastener first and release the chain (47) wherein the chain (47) is still attached to the attaching means (55) of the attached telescopic post (40). The chain block (45) enables the supported formwork to be gradually elevated and lowered to ensure more safety. Other form of height-adjusting means may also be used such as hydraulic or any other motorized means capably to ascend and descend the platform (50).

To facilitate the mobility of the support frame (10), a plurality of wheels (60) acting as the transportable means is attached at the bottom portion (10a) below the support frame (10). Beneath the support frame (10), preferably at least four wheels (60) are attached at each corner for moving the support frame (10) from one area to another. These wheels (60) may be locked in a fixed position during the operation of chain block (45).

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Referring now to Figures 3 and 4, the formwork supporting system (100) further comprises pivotable props (95) mountable at the underneath of the formwork. The pivotable prop (95) is constituted of an upper prop (20), a lower prop (25), and a connector (30) detachably mounted between the upper prop (20) and the lower prop (25). The pivotable props (95) mounted at the corner of the formwork is conveniently comprised of transporting means mounted to the connector (30). However, the pivotable prop (95) that is mounted at the periphery other than the corner of the formwork, as well as the pivotable props (95) mounted at the innerside of the formwork may also be

comprising transporting means at the connector (30) to further facilitates the mobility of the formwork supporting system (100). The transporting means may be essentially provided as detachable roller (75). The pivotable prop mounted at the corner of the formwork each having the detachable roller (75) at the connector (30) may now referred
5 as the corner pivotable props (95a).

The lower prop (25) is conveniently pivotable at the connector (30). To transform the corner pivotable prop (95a) into a mobile prop, the lower prop (25) and the connector (30) both are pivoted perpendicularly to the upper prop (20), the detachable roller (75)
10 would consequently contact the ground provided that the formwork is lowered to a required position. The roller (75) once turned downward and touching the ground permits horizontal movement beneath the corner pivotable props (95a) and enables the formwork to be transportable. When the corner pivotable props (95) are in upright position, the rollers (75) may be detached from the connector (30).

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Referring now to Figures 6 and 7, there is shown the pivotable props (95b) mountable at the inner and the peripheral portion of the underneath of the formwork and preferably having no transporting means being attached at the connector (30) like the corner pivotable prop (95a). Said pivotable prop (95b) constitutes an upper prop (20), a lower
20 prop (25), a connector (30) detachably mounted between the upper prop (20) and the lower prop (25). The lower prop (25) is also conveniently pivotable at the connector (30). When in construction operation, the pivotable props (95b) stand in unfolded upright position whilst during transportation of the formwork, the lower prop (25) is folded in order not to obstruct the movement of the formwork during transportation.

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In accordance to Figures 3 and 4, according to the preferred embodiment of the present invention, to ensure that the pivotable props (95) to be foldable, pivoting means (65) is conveniently provided. The pivoting means (65) may be provided as a pivoting pin fastened through a perforation (32) formed at the connector (30). The connector (30)
30 may be a plate having a number of through perforations (32) to be inserted with fasteners. Apart from the pivoting pin, a locking pin (70) is further provided to ensure the lower prop (25) is capable of being retained in an upright position when in operation or being locked in the folded position. For the locking pin (70), locking perforations

(32a) are provided whereby the locking pin (70) is inserted through locking perforations (32a). According to Figure 7, the pivotable prop (95) is shown in upright position and folded position. In upright position, the locking pin is secured at the shown locking perforation (32a). As for the folded position, the locking pin is secured at the other
5 locking perforation (32b). Corresponding locking bores for the locking pin (70) are also formed respectively at the upper prop (20) and the lower prop (25) in order that the lower prop (25) may be secured in the upright position or the folded position as shown in Figure 7. In Figure 3, the corner pivotable prop (95a) is shown being stood in an upright position. In Figure 4, the lower prop (25) together with the connector (30) is
10 shown rotating upwards.

Referring to Figure 7, the upper and lower props (20 & 25) may be made of solid hard wood. Alternatively, as illustrated in Figures 5 and 6, the lower prop (25) may also be provided as a telescopic lower prop (25a) attached to the connector (30). When striking a
15 formwork, the telescopic lower prop (25a) is required to be loosened. The telescopic lower prop (25a), which is used for adjusting the pivotable prop (95) height to the design requirement when the props (95) are in upright position, has an adjustable collar for moving the telescopic lower prop (25a) upwards or downwards and a retaining pin (25b) for securing the telescopic lower prop (25a) in the required position. A jacking base (80)
20 may also be provided at the bottom portion of the lower prop (25) to jack the formwork when required.

According to the preferred embodiment of the present invention, when assembling the
25 formwork, the supporting means (90) is placed at a predetermined location below the formwork. Normally, this predetermined location below the formwork is specified. After positioning the supporting means (90), the platform (50) is hoisted upwards by using the height-adjusting means to support the floor and beam formwork. The platform (50) may be made up of a plurality of beams forming a rectangular structure. The formwork may
30 then be elevated by the height-adjusting means to be prepared for construction proceedings. The pivotable props (95) may then be attached to the legs or directly attached underneath the formwork. The pivotable props (95) would all be retained in upright position to support said formwork. The supporting means (90) may be wheeled

away after the assembling preceedings. After completion of a construction, the support frame (10) is wheeled to the appropriate location beneath the formwork and the platform (50) is hoisted toward the formwork base. By now, the formwork is fully supported by the supporting means (90) besides the pivotable props (95). The locking pins (70) of the
5 pivotable props (95) are then allowed to be loosened up and the lower props (25) are folded upwards and securely locked in the folded position. This is to allow the whole formwork to be descended without any hindrance from the upright lower props (25). Consequently, the height-adjusting means would lower down the platform (50) slowly and the floor and beam formwork on the platform (50) would also be gradually moved
10 downward. The operation would be stopped once the platform (50) has reached a level where the rollers (75) of the folded corner pivotable props (95a) touch the ground. The rollers (95) at the bottom of the connector (30) and also the wheels (60) underneath the support frame (10) enable the floor and beam formwork to be conveniently transported any other transporting means to the next area for further usage.

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The formwork support system efficiently supports elevation, dismantlement and reusability of the supported formwork. The formwork supporting system is capable of retaining the original condition of the supported formwork, therefore the reuasability of a formwork is ensured for the proceeding constructions. The formwork supporting
20 system also eases the transportation of the formwork prior and after a construction. By employing the formwork supporting system, the supported formwork can be gradually elevated and descended, thus increasing the safety within the working environment. Damages on the formwork can also be prevented as the supporting means can adjustably elevate and descend the supported formwork, so that the supported formwork would not
25 collapse because of improper supporting.

Preferably, the formwork supporting system (100) is best suited to be utilized together with the formwork system described in another Malaysian patent with the patent application number PI20070233 that is also filed by the same inventor. The formwork
30 supporting system which is featured with compact design when combined with said formwork system can inevitably enable said formwork system to be wheeled out and to be conveniently lifted by a crane regardless of the crane size.

While in the foregoing specification this invention has been described in relation to certain preferred embodiments thereof and many details have been set forth for purpose of illustration, it will be apparent to those skilled in the art that the invention is
5 susceptible to additional embodiments and that certain of the details described herein can be varied considerably without departing from the basic principles of the invention.

CLAIMS

1. A formwork supporting system (100) comprising:
 - 5 supporting means (90) to support a formwork, the supporting means (90) having a support frame (10); a height-adjustable member mounted on the support frame (10); a platform (50) mounted on the top of the height-adjustable member; height-adjusting means and transporting means disposed at the bottom of the support frame (10); and
 - 10 a plurality of pivotable props (95) mountable to the underneath of the formwork, the pivotable props (95) each comprise an upper prop (20), a lower prop (25), a connector (30) detachably mounted between the upper prop (20) and the lower prop (25), the pivotable props (95a) mounted at the corner of the formwork further comprising transporting means mounted to the connector (30);
 - 15 wherein
 - the height-adjustable member at the top hoists the formwork; the height-adjusting means manipulates the positioning of the height-adjustable member; the transporting means
 - 20 enables the formwork support system to be movable; the lower prop (25) and the connector (30) are capable of being pivoted together; the platform (50) at the top forms a holding structure for supporting the underneath of the supported formwork the formwork support system is capable of facilitating the elevation, dismantlement and reusability of the formwork; and the formwork support system facilitates the transportation of the
 - 25 formwork prior and after a construction.
2. A formwork supporting system (100) according to claim 1, wherein the support frame (10) comprises a retaining member which retains the height-adjustable member.
- 30 3. A formwork supporting system (100) according to claim 1, wherein the retaining member is a hollow shaft (35) vertically mounted on the support frame (10) substantially spanning between the top and bottom portions (10b & 10a) of the support frame (10).

4. A formwork supporting system (100) according to claim 1, wherein the height-adjustable member comprises of a plurality of telescopic posts (40) each slidably connected to one another and engaging means which prevent the telescopic posts (40) from sliding off characterized in that the telescopic posts (40) each having respectively
5 different cross sections, and the telescopic post (40) relatively at the upper position has a relatively small cross sectional area telescopically received into the telescopic post (40) relatively at the lower position that has a relatively large cross sectional area.
5. A formwork supporting system (100) according to claim 1, wherein the telescopic
10 post (40) at the bottommost position (40a) having relatively small cross sectional area is telescopically received into the hollow shaft (35) that has a relatively large cross sectional area.
6. A formwork supporting system (100) according to claim 1, wherein the height
15 adjusting means is a chain block (45) mounted at the top portion (10b) of the support frame (10).
7. A formwork supporting system (100) according to claim 1, wherein the platform
20 (50) is mounted on the top of the telescopic post located at the topmost position (40b) to support the formwork.
8. A formwork supporting system (100) according to claim 1, wherein the telescopic
posts (40) each further comprising attaching means (55) characterized in that the
attaching means (55) of the telescopic post (40) is coupled to the chain (47) of the chain
25 block (45) characterized in that the position of the coupled telescopic post (40) relative to the hollow shaft (35) is manipulated by having a user pulling the chain (47) to elevate the platform (50) to a desired height and having the user releasing the chain (47) to lower down the platform (50) to a desired height.
- 30 9. A formwork supporting system (100) according to claim 1, wherein a passage (41) is formed from the top end and terminates approximately at the bottom end of each of the telescopic posts (40) excluding the topmost telescopic post (40b), whereby the sliding of the attaching means (55) of the relatively inner telescopic post (40) along the

passage (41) of the relatively outer telescopic post (40) is enabled.

10. A formwork supporting system (100) according to claim 1, wherein the transporting means of the supporting means (90) is a plurality of wheels (60) which
5 facilitates the movement of the formwork supporting system (100).

11. A formwork supporting system (100) according to claim 1, wherein the connector (30) comprises pivoting means (65) fastened thereon and locking means (70) releasably fastened thereon whereby the locking means (70) is unfastened to allow the lower prop
10 (25) together with the connector (30) to be pivotable and the locking means (70) is fastened to lock the pivotable prop (95) in an upright position when the formwork is in use and to lock the pivotable prop (95) in a folded position when the formwork is required to be lowered and transported to a different location.

15 12. A formwork supporting system (100) according to claim 1, wherein the transporting means of the pivotable props (95) is detachable rollers (75) mounted thereon characterized in that the lower prop (25) and the connector (30) are pivoted with the detachable roller (75) facing downward to permit the horizontal movement beneath the pivotable prop (95).

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13. A formwork supporting system (100) according to claim 1, wherein the lower prop (25) and the connector (30) of the pivotable prop (95) is folded facilitating the detachable roller (75) to touch the ground and the formwork to be transportable to a different location on the detachable rollers (75) prior and after a construction.

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14. A formwork supporting system (100) according to claim 1, wherein the lower prop (25) further comprises a jacking base (80) at the bottom portion of the lower prop (25) to jack the formwork when required.

30 15. A formwork supporting system (100) according to claim 6, wherein the chain block (45) is hand operated and functioned as a hoisting appliance.