Title: COLLAPSIBLE SCAFFOLDING TOWER

Abstract: A collapsible scaffolding tower having four uprights arranged in two pairs, wherein each of the uprights is formed of three or more telescopically collapsible sections and rigid horizontal bars extend between the sections of the uprights in each pair to form two telescopically collapsible ladder structures, which rest directly on the ground when the tower is in use.
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:
— with international search report
COLLAPSIBLE SCAFFOLDING TOWER

Field of the invention

The present invention relates to a collapsible scaffolding tower.

Background of the invention

It is known to form a scaffolding tower from similar rigid frames that are designed to slot into one another. Each frame is formed of tubular steel with two uprights poles, two horizontal bars and additional struts to maintain the rigidity of the frame. The upright poles have different diameters at their upper and lower ends so that the bottom of one frame can be fitted over the top of another. To assemble the tower, two frames are positioned at the sides of the tower, then frames at the front and rear of the tower are joined to the side frames. The process is then repeated by placing two further frames at the sides of the tower and joining them to the front and rear frames.

When collapsed, such towers are very bulky and when erected they are rickety because they rely on a good fit between the individual frames to give the tower its rigidity.

GB 1,311,569, shows collapsible scaffolding made up folding sections that slot into one another. The scaffolding when collapsed consists of several separate sections and is not therefore very compact nor easy to transport.

GB 988,270 also shows a complex collapsible scaffolding that is formed of a base frame, an extension frame and various bracing elements. Once again the use of separate frames makes the structure bulky when collapsed.
Object of the invention

The present invention thus seeks to provide a scaffolding tower that is compact when collapsed, that is easy to erect and that is sturdy when assembled.

Summary of the invention

According to the present invention, there is provided a collapsible scaffolding tower having four uprights arranged in two pairs, wherein each of the uprights is formed of three or more telescopically collapsible sections and rigid horizontal bars extend between the sections of the uprights in each pair to form two telescopically collapsible ladder structures, which rest directly on the ground when the tower is in use.

In GB 988,270, does disclose an extension frame having telescopically collapsible legs. However, unlike the ladder structures of the present invention, the extension frame needs to rest on the base frame, not on the ground, and it provides only one extendible section.

While it would be possible to interconnect two collapsible ladder structures using detachable cross members to form a rigid tower, such a tower would need at least two people to assemble it. To permit single handed assembly, it is preferred for the lowermost sections of the two collapsible ladder structures to be permanently connected to one another by a folding or collapsible structure that allows the two ladder structures to move towards and away from one another while remaining essentially parallel to one another.

Such a collapsible structure may comprise a lazy tongues or trellis-like system of pivoted bars to connect the ladder structures to one another, but it is preferred to
use a folded gate formed of two leaves which are pivoted about vertical axes to one another and to respective ones of the sections of the uprights of the two ladder structures.

5 Brief description of the drawings

The invention will now be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a first embodiment of the invention in its extended position,

Figure 2 shows a front view of a gate structure of the preferred embodiment when in the extended position,

Figure 3 shows a side view of a first embodiment when attached to a ladder,

Figure 4 shows an alternative perspective view to that of figure 1, and

Figure 5 shows a perspective view of a second embodiment of the present invention when in its extended position.

Detailed description of the preferred embodiment

Figure 1 shows a scaffolding tower 10, two opposing sides of which each consist of a telescopic ladder structure 12 and 14. The remaining opposing sides of the tower are formed by a collapsible gate 18 and a cross brace 34. The rungs 20b of the telescopic ladder structures 12, 14 support a platform 36 similar to those which can be found on conventional scaffolding towers.

The telescopic ladder structures 12, 14 have stiles 16 formed of telescopically collapsible tubular sections 16a, 16b and 16c. Each section supports a rung 20a, 20b and 20c. When extended, the tubular sections lock into each other, by means of spring loaded pins (not shown), thereby preventing the stiles 16 from collapsing when in use. Further security
can be attained by providing an additional pin which can be manually inserted in a hole through any two aligned telescoping sections 16a, 16b or 16c. When collapsed, the three rungs 20a, 20b and 20c lie adjacent one another. This allows the sides of the tower when extended to be approximately three times their collapsed height.

Figure 2 shows the third side of the tower which is formed by joining the two opposing ladder structures to each other on one side by a gate 18 having two gate leaves 24 and 26.

The gate leaves 24, 26 are formed from an open frame, and hinged to each other about a vertical axis. The remaining vertical edges of the gate 18 are hingedly attached to the lowest section 16a of the telescopic stile 16 of the respective ladder structure. This arrangement positions both ladder structure ends of the tower approximately upright enabling construction to be carried out by one person.

In the preferred embodiment, the leaves of the gate are symmetrical about the hinge 44 joining them and trapezium in shape. As a result, the ladder structures do not lie exactly parallel to one another but form a more sturdy A-frame. The hinges still allow the leaves to fold inwards when collapsed, about the centre hinge 44.

A support bar 28 is positioned just above the foot of each ladder structure between its stiles 16, in line with the lower edge of the collapsible gate 18, thereby adding to the rigidity of the structure. Rigidity is still further increased by the provision of bracing rods 30 and 32 which extend diagonally between the support bar 28 and rung 20a on each ladder structure. The tensioned crossed arrangement resists racking in either direction.
The fourth and final side of the tower 10 is formed by the insertion of a cross brace 34 parallel to the gate 18 spanning either between the vertical stiles 16 of the ladder structures 12, 14 or between the support rungs 28. The cross brace 34 is secured to either of these using conventional methods such as threaded clamps.

This completes the first level of the tower 10. The second and third rungs 20b and 20c of telescopic ladder structures 12, 14 define the second and third levels when the ladder structures are extended to full height. Platform 36 for providing a support floor for a user of the tower, is supported on rung 20b and locked thereto using suitable means. This will further increase structural rigidity of the tower.

Figure 3 shows a ladder 46 secured to the tower to allow easy access to the platform. The ladder 46 may itself be collapsible for ease of transportation. To aid with assembly, a ladder 46 may be secured to either of rungs 20a. This provides stability whilst enabling the user to reach high enough to insert the platform boards.

Though the A-frame structure is not prone to racking, its rigidity is improved further by the inclusion of telescopic tension rods 38 and 40. These are similar in function to bracing rods 30 and 32. The telescopic nature of the rods 38 and 40, allows them to also retract in a direction required for the tower 10 to collapse when not in use. This feature is not a requirement of bracing rods 30 and 32 since they span a distance which remains constant regardless of the configuration of the tower. The telescopic tension rods 38 and 40 diagonally span from support bar 28 of one ladder structure to rung 20b of the opposing ladder structure. The telescopic tension rods 38, 40 can employ spring loaded locking pins, similar to those used in the telescopic stiles 16 of the ladder structures 12, 14. These
would give the rods strength in both tension and compression but would make the tower more difficult to collapse. In place of pins, one could use spring biased pawl-like members to prevent the rods from being extended without interfering with their collapse. It should be noted that for the tower to be totally collapsible, the telescopic tensioning rods 38, 40 must each comprise at least three sections. Alternatively, the telescopic tension rods 38, 40 may be replaced with fixed support rods which would require attachment each time the tower is erected.

For safety as well as rigidity, a support bar 42, is secured between rungs 20c of the opposing ladder structures 12, 14. This completes the erected tower but further reinforcements can be employed.

For the purposes of collapsing the tower 10, support bar 42, platform 36 and cross brace 34 must all be removed. It is then necessary to retract the telescopic stiles 16, by releasing the spring loaded pins and pulling the upper rungs 20b and 20c in a downwards direction.

At this stage the partially collapsed tower appears similar to a child's play pen. The final stage of collapsing requires that the collapsible gate 18 is bent about its hinge 24, towards the now partially retracted telescopic tension rods 38, 40. When viewed from above, the tower at this point would appear M-shaped. The gate 18 is then fully folded and the ladder structures 12, 14 brought together, at the same time the telescopic tension rods will be in their fully retracted position. This final position is very space efficient and makes for ease of storage and transportation.

Figure 5 shows a second embodiment intended for use primarily as a conventional scaffolding tower again with the advantage that it may be collapsed and easily erected by one person.
Tower 50 is similar in construction to the previous embodiment, the main difference being that the ladder structures which form the sides of the tower 50 are parallel. To aid in construction the present embodiment uses a collapsible gate 56 similar to that described with reference to the previous embodiment.

The second embodiment further differs by employing two platforms 58. These may have a cut-out 60 formed therein, enabling a ladder to be placed between the platforms to allow ascent onto the upper level.

The embodiment of Figure 5 also employs support rungs 62 similar to support rungs 28. Racking in two directions is reduced by telescopic braces 64 and 66 which are attached between each of the rungs of the telescopic ladder structures 52 and 54. The braces 64 and 66 are formed of telescoped sections that can collapse one inside the other but a catch or other abutment prevents their extension beyond a certain point. Because they cannot be extended beyond a certain point, they act in the same way as taut wires to prevent racking but because they can be collapsed they do not interfere with the collapsing of the scaffolding.

Racking in the direction parallel to the width of the tower is further reduced by longer telescopic braces 68 and 70 which stretch between the rungs of adjacent levels of the opposing ladder structures. These may be replaced by rigid removable braces, but this arrangement would not be as easily erected or collapsed.
Claims

1. A collapsible scaffolding tower having four uprights arranged in two pairs, wherein each of the uprights is formed of three or more telescopically collapsible sections and rigid horizontal bars extend between the sections of the uprights in each pair to form two telescopically collapsible ladder structures, which rest directly on the ground when the tower is in use.

2. A collapsible scaffolding tower as claimed in claim 1, wherein the two collapsible ladder structures are permanently connected to one another by a folding or collapsible structure that allows the two ladder structures to move towards and away from one another while remaining essentially parallel to one another.

3. A collapsible scaffolding tower as claimed in claim 2, wherein the collapsible structure is a folded gate formed of two leaves which are pivoted about vertical axes to one another and to respective sections of the uprights of the two ladder structures.

4. A scaffolding tower as claimed in any preceding claim, in which the ladder structures are inclined relative to one another at small acute angle such that the tower is narrower at its top than at its base.

5. A scaffolding tower as claimed in any preceding claim, wherein collapsible braces extend between the ladder structures and between the stiles of each ladder structure in order to prevent racking.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 E04G1/34 E04G1/16

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E04G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the International search (name of data basis and, where applicable, search terms used)

EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>WO 95 27836 A (VIANDON MAURICE) 19 October 1995 (1995-10-19) figures 9,10,13</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>EP 0 653 529 A (JAPAN STEELS INTERNATIONAL INC) 17 May 1995 (1995-05-17) figures</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>US 3 313 081 A (SQUIRE ROBERT K) 11 April 1967 (1967-04-11) figures</td>
<td>1</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of box C. Patient family members are listed in annex.

* Special categories of cited documents:

A*° document defining the general state of the art which is not considered to be of particular relevance
E° earlier document but published on or after the international filing date
L° document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
O° document referring to an oral disclosure, use, exhibition or other means
P° document published prior to the international filing date but later than the priority date claimed
T° later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
X° document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
Y° document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*° document member of the same patent family

**Date of the actual completion of the International search**

6 September 2002

**Date of mailing of the International search report**

12/09/2002

**Name and mailing address of the ISA**

European Patent Office, P.B. 5618 Patentlaan 2 NL - 2202 HV Rijswijk Tel: (+31-70) 340-2500, Tx: 31 651 epi nl Fax: (+31-70) 340-3016

Authorized officer

Andlauer, D
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ES 254133 Y</td>
<td>01–11–1981</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FR 2471466 A3</td>
<td>19–06–1981</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NL 8006557 A</td>
<td>01–07–1981</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 7139149 A</td>
<td>30–05–1995</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DE 69407388 D1</td>
<td>29–01–1998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DE 69407388 T2</td>
<td>16–04–1998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 185602 B1</td>
<td>01–04–1999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 5474151 A</td>
<td>12–12–1995</td>
</tr>
</tbody>
</table>

Form PCT/W512/10 (patent family annex) (July 1992)