

HINGED POLES

THIS INVENTION relates to masts and the like, and, in particular, to improvements in the means by which masts may be raised and lowered.

Prior Australian Patent No. 494746 describes one such folding mast. Other similar masts are seen in prior Australian Patent Application No. 23889/84 and in PCT/AU83/00171. Folding masts are hinged at some point and a mechanism is provided whereby the mast is locked at the vertical, can be unlocked, and lowered to ground level, being angled down about its hinge. Various proposals exist whereby this is achieved as seen in the above references but no totally satisfactory means of operating a mast exists.

It is, therefore, an object of the present invention to provide a mast whereby the mast may be lowered about its hinge utilising an operation which is simpler to perform.

Other objects, and various advantages of the invention will hereinafter become more apparent.

The present invention provides a folding mast able to be lowered, which mast comprises a lower support section, an upper section, pivot means interconnecting the lower section and the upper section, latch means and latch retrieval means, wherein the upper section is vertically moveable, in use, between a first position, in which the upper and lower sections are locked against relative angular movement, and a second position, in which the latch means is operative to permit angular movement of the upper section about the pivot means and in which the upper section may be lowered, the latch means comprising an overbalanced member arranged, in use, to fall under gravity

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to a locking position when the upper section is in the second position, the latch means being operative to retain the upper section in the second position when the latch means is in the locking position, the latch retrieval means being operative to engage the latch means and withdraw the same from the locking position when the upper section is in the second position, and the pivot means being provided with a bearing, wherein the pivot means and the bearing are, in use, vertically movable with the upper section as the upper section moves between the first position and the second position.

The lower support section may extend vertically as a post to provide a pivot at a relatively low level at which folding may take place, with an upper clevis at a readily accessible height to enable folding with little difficulty. The lower support section may be firmly anchored to the ground, either by being bolted thereto or otherwise fixed by any suitable means.

The upper section may be elongate such as a mast or pole extended generally vertically in the locked position to support fixtures at an elevated position. The upper section may, for example, serve as a light pole, flag pole, sign support, support for aerials, etc..

The bearing of the above set out folding mast may also be arranged to remain constrained against rotative movement whilst moving with the upper section. Provision of the bearing enables the load on the pivot means, the weight of the upper section, to be better distributed, as well as enabling greater load capacities to be achieved and excessive wear on the pivot shaft to be reduced.

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The invention will now be described with reference to a preferred embodiment as shown in the accompanying drawings, in which:-

Figure 1 shows a side elevation of a folding mast;

Figure 2 shows a front elevation of the folding mast of Figure 1;

Figure 3 shows a side elevation of the folding mast of Figure 1 in which the disposition of the elements are shown at a partially lowered point in the operation of the folding mast;

Figure 4 illustrates the relative positions of latches and pivots when the folding mast of Figures 1 to 3 is locked at the vertical position;

Figure 5 illustrates the relative positions of latches and pivots when the folding mast of Figures 1 to 3 is rotated;

Figure 6 shows a side elevation of a folding mast according to an embodiment of the present invention; and

Figures 7 to 9 illustrate features of the folding mast of Figure 6.

In Figures 1 to 3, a mast 22 is mounted above a bottom support section or lower section 11 which serves as a base support of the mast and which can be flanged, etc, with provision for being bolted down in place to hold the upper section or mast 22 erect. The mast 22 is connected to the lower section 11 with an intermediate rotating section 12, which is joined to the lower section 11 by a

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pivot means or shaft 13, by which the mast 22 may be lowered. The rotating section 12 drops down over the top of the lower section to telescope the two to a degree and to lock the two in the vertical position. So as to be able to fold the mast down, a jacking screw 18 may be provided, acting between an upper clevis point 19 on the rotating section 12 and a lower clevis point 20 on the lower section 11. The operation of the jacking screw 18 is to raise the rotating section 12 above the lower section 11 to a point whereat the rotating section 12 is clear of the lower section 11 and is able to rotate angularly thereabout on pivot shaft 13. The raising of the rotating section 12 is permitted at the pivot shaft 13 by providing slot 14 in the lower section for passage of the pivot shaft 13 which can then rise in the slot 14 as the jacking screw 18 operates to raise the rotating section 12.

As the rotating section 12 is raised, the pivot shaft 13 eventually clears a latch 15 which may then fall into a latch stop 17, whereat the pivot shaft 13 may not drop back to the bottom of the slot 14 and the rotating section 12 is held above the lower section 11 at a point where it is free to rotate about the pivot shaft 13. The mast 22 may then be lowered. To reverse the process, the jacking screw 18 needs be operated, the latch 15 withdrawn

and the rotating section lowered to its locked position. In the locked position, a safety locking screw 21 may be utilised to lock the upper and lower sections together. In operation of the latch 15, a latch bolt 16 may be
5 provided, which bolt may be undone to release the latch to allow its fall onto latch stop 17 when clear by raising pivot shaft 13. In reverse, action of latch bolt 16 may be to catch latch 15 and pull it back off latch stop 17 to clear pivot shaft 13 for movement back
10 to the bottom of slot 14 and the locked position of mast 12.

In FIG. 3, mast 22 is shown partly lowered. Its weight can be taken on jacking screw 18 as it is lowered by action of the jacking screw. FIGS. 4 and 5
15 show schematically the relative dispositions of latch 15 in relation to pivot shaft 13 in slot 14 in the vertical mode of FIG. 4 and the free for rotation disposition of FIG. 5.

In the above, the latch stop 17 may assist in
20 carrying loads when turning the rotating section. The jacking screw might be replaced by a hydraulic cylinder or the like. The jacking screw or hydraulic cylinder can be the means by which the mast is returned to the vertical with the screw or ram being expanded to do the
25 raising. When the safety locking screws are in place, the screw or ram can be removed.

In the above, the latching mechanism used in the raising and lowering operations can be enclosed within the base section, which secures it from being
30 tampered with, and avoids ingress of foreign matter into the working parts.

In practice of the invention, the mast 22 is locked in the vertical position and held by safety locking screws. If the mast is to be lowered, a jacking
35 screw, ram, etc, is fitted between clevis points on respective upper and lower sections. The locking screws

are undone and the latch bolt unscrewed to release the latch. The jack is operated to lift the mast when the latch falls beneath the pivot to hold the mast aloft in its unlocked position, when the jack may be used in lowering the mast down angularly about the pivot. When desired, the mast may be raised by reversal of the above procedures. The falling of the latch when cleared by the pivot provides a simpler, more efficient, means of lowering the mast.

The pivot shaft 13 shown in Figures 6 to 9 operates in a pivot shaft bearing 23 which is guided in slots 14 in the base section 11. The purpose of the pivot shaft bearing 23 is to provide an efficient bearing for the shaft 13 and the ends of the bearing may be guided by end plates 24 in the slots 14, thereby preventing the bearing from rotating and ensuring that the shaft 13 rotates in the bearing 23 without the pivot shaft bearing 23 rotating in the slots 14 or on the latch 15. The latch 15 may comprise two latch plates 25 and 26 interconnected by rods 27 and 28 as can be seen in Figure 9 and the latch 15 holds the pivot shaft bearing 23 in the up position to enable the rotating section 12 to be rotated from the vertical to the horizontal position and vice versa. A latch bolt 16 is used to hold the latch 15 in the vertical position and to assist in placing the column in the vertical locked position. Latch stop 17 stops the latch 15 in the forward position and assists in carrying the load when turning the rotating section. The latch 15 may turn about rod 28.

Operation of the device shown in Figures 6 to 9 is achieved by attaching a raising and lowering mechanism such as a hydraulic cylinder or a jacking screw 18 to clevis points 19 and 20. To lower the mast 22 the latch screw 16 is released to allow the latch 15 to fall against the latch stops 17 when the rotating section is raised to

its uppermost position. The uppermost position of the rotating section 12 is reached when the pivot shaft bearing 23 reaches the top of the slots 14 in the base 11. Expanding the raising and lowering device 18 raises the mast and allows the latch 15 to fall against the stops 17. The raising and lowering mechanism 18 is then operated to retract and the mast 22 will rotate to the horizontal position.

Expanding the raising and lowering mechanism 18 rotates the mast 22 to the vertical position, the latches are then returned to the vertical position by means of the latch screw 16, the mast is lowered to its down position by retracting the raising and lowering mechanism 18 and the safety locking screws 21 fixed in position. The raising and lowering mechanism 18 is then removed and the mast apparatus ready for use.

In the above there is described a device for use in raising and lowering a mast from the horizontal to the vertical positions by means of a pivoting action. The device is self locking in the vertical position to ensure the joint is stable and will not pivot until a rotating device is attached and operated. Safety locking bolts are provided as an added precaution to prevent accidental movement from the vertical locked position.

The invention is for use in applications where equipment is to be installed at various heights above ground level. Applications for the invention would include lighting used in areas such as sports fields, work places, roads, highways and airports; advertising signs; radio and television transmitting and receiving antennae etc, where ease of access for installation and maintenance are of importance.

The equipment to be mounted to the device is attached either directly to or mounted on a column attached to the rotating section of the device.

Equipment installation is carried out at ground level when the rotating section is set in the horizontal position. Maintenance of the equipment is also carried out in this horizontal position thus eliminating the
5 necessity for the use of ladders, tower cranes, climbing rungs etc, thus avoiding problems associated with working at heights.

The raising and lowering from the horizontal to the vertical positions is accomplished by attaching
10 either an hydraulic ram with its associated power pack to operate the ram in the expand or retract positions or by a mechanical screw jack either hand or power operated.

Various changes and modifications may be made
15 to the embodiments described without departing from the scope of the present invention.

**CLAIMS**

1. A folding mast able to be lowered, which mast comprises a lower support section, an upper section, pivot means interconnecting the lower section and the upper section, latch means and latch retrieval means, wherein the upper section is vertically moveable, in use, between a first position, in which the upper and lower sections are locked against relative angular movement, and a second position, in which the latch means is operative to permit angular movement of the upper section about the pivot means and in which the upper section may be lowered, the latch means comprising an overbalanced member arranged, in use, to fall under gravity to a locking position when the upper section is in the second position, the latch means being operative to retain the upper section in the second position when the latch means is in the locking position, the latch retrieval means being operative to engage the latch means and withdraw the same from the locking position when the upper section is in the second position, and the pivot means being provided with a bearing, wherein the pivot means and the bearing are, in use, vertically movable with the upper section as the upper section moves between the first position and the second position.

2. A folding mast according to Claim 1, wherein the upper section is elongate, the upper and lower sections are generally tubular in character adjacent the pivot means and the upper and lower sections are telescopically interengaged in the first position with the upper section outside the lower section, the upper elongate section being moveable, in use, axially relative to the lower section from the first position to the second position and wherein



the latch means prevents relative movement back to the locked position unless the latch means is held in a disengaged state.

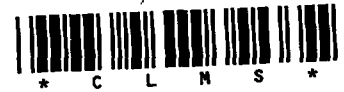
3. A folding mast according to Claim 1 or 2, wherein the pivot means comprises a pivot shaft passing through the upper and lower sections, the pivot shaft passing through a vertically extended slot in the lower section so as to enable movement of the pivot shaft with the upper section as the upper section moves between the first position and the second position.

4. A folding mast according to Claim 3, wherein the bearing comprises a cylindrical bearing, an end of which is engaged in the slot so as to enable the cylindrical bearing to move therealong with movement of the pivot shaft.

5. A folding mast according to Claim 3 or 4, wherein the bearing is fitted with an end plate, the end plate being engaged in the slot for constraining rotational movement of the bearing.

6. A folding mast according to any one of Claims 3 to 5, wherein the latch means, in use, moves beneath the pivot shaft when the upper section is in the second position so as to prevent movement of the pivot shaft and the upper section back to the first position.

7. A folding mast according to anyone of Claims 4 to 6, wherein the latch means comprises an over balanced pivoted latch which rests on the cylindrical bearing when the upper section is in the first position and moves under gravity between a first open position out of the path of the pivot shaft, the path of the pivot shaft being defined



by the slot, and a second closed position in the path of the pivot shaft.

8. A folding mast according to any one of the preceding claims, wherein the latch retrieval means comprises a bolt for retrieving the latch means from its locking position.

9. A folding mast according to any one of the preceding claims, wherein the upper and lower sections are provided with clevis points between which a ram may be fitted for lifting the upper section to the second position and then lowering the upper section, or vice versa.

10. A folding mast substantially as hereinbefore described with reference to and as shown in Figures 6 to 9 of the accompanying drawings.
