CLAIMS

1. A multistage telescopic arm device comprising:

a telescopic arm (12) that is provided on a distal end side of a boom (4) of a mount target to be extendible in the upper-lower direction and includes an outer tube (13) and multistage inner tubes (21, 23) accommodated inside of said outer tube (13) to be extensible in the length direction;

a telescopic cylinder (25) that is provided along the length direction of said outer tube (13) configuring part of said telescopic arm (12);

arm extension fixed sheaves (31, 31') that are fixedly provided on said outer tube (13);

a sheave mounting member (30) that is mounted on said telescopic cylinder (25) and moves in the length direction of said outer tube (13) in such a manner as to come close to or be away from said arm extension fixed sheaves (31, 31');

arm extension movable sheaves (33, 33') that are provided on said sheave mounting member (30); and

arm extension ropes (34, 34') one end side of each of which is fixed to said outer tube (13), the other end side of each of which is fixed to an innermost inner tube (23) of said inner tubes (21, 23), and a midway section of each of which is wound around each of said arm extension fixed sheaves (31, 31') and each of said arm extension movable sheaves (33, 33'), characterized in that:

said telescopic cylinder (25) is configured of a hydraulic

cylinder comprising a tube (25A), and a rod (25B) one side of which is fixed to a piston in said tube (25A) and the other side of which projects outside from said tube (25A),

a distal end part of said rod (25B) is attached to said outer tube (13) of said telescopic arm (12) in a state where said rod (25B) of said telescopic cylinder (25) faces upward and said tube (25A) of said telescopic cylinder (25) is formed as a free end, and

said sheave mounting member (30) is mounted to said tube (25A) of said telescopic cylinder (25).

2. The multistage telescopic arm device according to claim 1, wherein the distal end part of said rod (25B) in said telescopic cylinder (25) is attached to an upper part side of said outer tube (13).

3. The multistage telescopic arm device according to claim 1, wherein a sheave mounting member guide rail (28) is provided outside of said outer tube (13), said sheave mounting member guide rail (28) being mounted on said outer tube (13) to extend in the length direction in parallel to said outer tube (13), and

said sheave mounting member (30) moves along said sheave mounting member guide rail (28) in response to extension and contraction of said telescopic cylinder (25).

4. The multistage telescopic arm device according to claim 1, wherein a pair of boom brackets (17) are provided outside of said outer tube (13) and in a lower section of said outer tube

(13) than said sheave mounting member (30), said pair of boom brackets (17) facing with each other with an interval in the left-right direction and being mounted to the distal end side of said boom (4) to be able to be rocked thereto, and

said tube (25A) of said telescopic cylinder (25) is arranged in a gap (17B) formed between said pair of boom brackets (17).

5. The multistage telescopic arm device according to claim 1, wherein a tube guide (26) is provided outside of said outer tube (13) to movably accommodate said tube (25A) of said telescopic cylinder (25) and guide said tube (25A) in the length direction of said outer tube (13).

6. The multistage telescopic arm device according to claim 1, wherein said outer tube (13) is formed in an angular tube shape having a cross-section configuration of a polygonal shape including at least a rear surface (13A) attached to a distal end side of said boom (4), a front surface (13B) facing said rear surface (13A) in the front-rear direction, a left side surface (13C) and a right side surface (13D) that are opposed to each other in the left-right direction having said rear surface (13A) and said front surface (13B) therebetween, a left inclined surface (13E) arranged to be obliquely inclined between said rear surface (13A) and said left side surface (13C), and a right inclined surface (13F) arranged to be obliquely inclined between said rear surface (13A) and said right side surface (13D), and

said arm extension movable sheaves (33, 33') are arranged closer to the outside in the left-right direction than said left

and right side surfaces (13C, 13D) configuring part of said outer tube (13).

7. The multistage telescopic arm device according to claim 1, wherein said outer tube (13) is formed in an angular tube shape having a cross-section configuration of a hexagonal shape including a rear surface (13A) attached to a distal end side of said boom (4), a front surface (13B) facing said rear surface (13A) in the front-rear direction, a left side surface (13C) and a right side surface (13D) that are opposed to each other in the left-right direction having said rear surface (13A) and said front surface (13B) therebetween, a left inclined surface (13E) arranged to be obliquely inclined between said rear surface (13A) and said left side surface (13C), and a right inclined surface (13F) arranged to be obliquely inclined between said rear surface (13A) and said right side surface (13D).

8. The multistage telescopic arm device according to claim 1, wherein pushing mechanisms (38, 38′) are provided between said outer tube (13) and a first-stage inner tube (21) positioned in the outermost side among said multistage inner tubes (21, 23), said pushing mechanisms (38, 38′) pushing in said first-stage inner tube (21) in the extension direction at the time of extending said first-stage inner tube (21) from said outer tube (13) by said telescopic cylinder (25),

said pushing mechanisms (38, 38′) respectively includes:

pushing fixed sheaves (39, 39′) provided in said outer tube (13) to be positioned in a lower part side of said outer tube

(13);

pushing movable sheaves (41, 41′) provided in said sheave mounting member (30) in a lower position than said arm extension movable sheaves (33, 33′); and

pushing ropes (42, 42′) one end side of each of which is fixed to said outer tube (13), the other end side of each of which is fixed to said first-stage inner tube (21) through an inside of said outer tube (13), and a midway section of each of which is wound around each of said pushing fixed sheaves (39, 39′) and each of said pushing movable sheaves (41, 41′),

sheave mounting openings (16, 16′) are provided in the lower part side of said outer tube (13) and in positions where said pushing fixed sheaves (39, 39′) are provided, and

a part of each of the pushing fixed sheaves (39, 39′) is arranged inside of said outer tube (13) through each of said sheave mounting openings (16, 16′).

9. A deep digging excavator including an automotive vehicle body (2, 3), a boom (4) liftably provided on said vehicle body (2, 3), and a multistage telescopic arm device (11) provided in a distal end side of said boom (4),

wherein said multistage telescopic arm device (11) comprising:

a telescopic arm (12) that includes an outer tube (13) extending in the upper-lower direction and multistage inner tubes (21, 23) accommodated inside of said outer tube (13) to be extensible in the length direction;

a telescopic cylinder (25) that is arranged along the length

direction of said outer tube (13) configuring part of said telescopic arm (12);

arm extension fixed sheaves (31, 31') that are fixedly provided on said outer tube (13);

a sheave mounting member (30) that is mounted on said telescopic cylinder (25) and moves in the length direction of said outer tube (13) in such a manner as to come close to or be away from said arm extension fixed sheaves (31, 31');

arm extension movable sheaves (33, 33') that are provided on said sheave mounting member (30); and

arm extension ropes (34, 34') one end side of each of which is fixed to said outer tube (13), the other end side of each of which is fixed to an innermost inner tube (23) among said inner tubes (21, 23), and a midway section of each of which is wound around each of said arm extension fixed sheaves (31, 31') and each of said arm extension movable sheaves (33, 33'),

characterized in that:

said telescopic cylinder (25) comprises a hydraulic cylinder including a tube (25A), and a rod (25B) one side of which is fixed to a piston in said tube (25A) and the other side of which projects outside from said tube (25A);

a distal end part of said rod (25B) is attached to said outer tube (13) of said telescopic arm (12) in a state where said rod (25B) of said telescopic cylinder (25) faces upward and said tube (25A) of said telescopic cylinder (25) is formed as a free end; and

said sheave mounting member (30) is mounted to said tube (25A) of said telescopic cylinder (25).

CLAIMS

1. A multistage telescopic arm device comprising:

a telescopic arm that is provided on a distal end side of a boom of a mount target to be extendible in the upper-lower direction and includes an outer tube and multistage inner tubes accommodated inside of said outer tube to be extensible in the length direction;

a telescopic cylinder that is provided along the length direction of said outer tube configuring part of said telescopic arm;

arm extension fixed sheaves that are fixedly provided on said outer tube;

a sheave mounting member that is mounted on said telescopic cylinder and movably supported to said outer tube in the length direction of said outer tube in such a manner as to come close to or be away from said arm extension fixed sheaves;

arm extension movable sheaves that are provided on said sheave mounting member; and

arm extension ropes one end side of each of which is fixed to said outer tube, the other end side of each of which is fixed to an innermost inner tube of said inner tubes , and a midway section of each of which is wound around each of said arm extension fixed sheaves and each of said arm extension movable sheaves, characterized in that:

said telescopic cylinder is configured of a hydraulic cylinder comprising a tube, and a rod one side of which is

fixed to a piston in said tube and the other side of which projects outside from said tube,

a distal end part of said rod is attached to said outer tube of said telescopic arm in a state where said rod of said telescopic cylinder faces upward and said tube of said telescopic cylinder is formed to be movable in the length direction of said outer tube, and

said sheave mounting member is mounted to said tube of said telescopic cylinder.

2. The multistage telescopic arm device according to claim 1, wherein the distal end part of said rod in said telescopic cylinder is attached to an upper part side of said outer tube.

3. The multistage telescopic arm device according to claim 1, wherein a sheave mounting member guide railis provided outside of said outer tube, said sheave mounting member guide rail being mounted on said outer tube to extend in the length direction in parallel to said outer tube, and

said sheave mounting member moves along said sheave mounting member guide rail in response to extension and contraction of said telescopic cylinder.

4. The multistage telescopic arm device according to claim 1, wherein a pair of boom brackets are provided outside of said outer tube and in a lower section of said outer tube than said sheave mounting member, said pair of boom brackets

facing with each other with an interval in the left-right direction and being mounted to the distal end side of said boom to be able to be rocked thereto, and

said tube of said telescopic cylinder is arranged in a gap formed between said pair of boom brackets.

5. The multistage telescopic arm device according to claim 1, wherein a tube guide is provided outside of said outer tube to movably accommodate said tube of said telescopic cylinder and guide said tube in the length direction of said outer tube.

6. The multistage telescopic arm device according to claim 1, wherein said outer tube is formed in an angular tube shape having a cross-section configuration of a polygonal shape including at least a rear surface attached to a distal end side of said boom, a front surface facing said rear surface in the front-rear direction, a left side surface and a right side surface that are opposed to each other in the left-right direction having said rear surface and said front surface therebetween, a left inclined surface arranged to be obliquely inclined between said rear surface and said left side surface, and a right inclined surface arranged to be obliquely inclined between said rear surface and said right side surface, and

said arm extension movable sheaves are arranged closer to the outside in the left-right direction than said left and right side surfaces configuring part of said outer tube.

7. The multistage telescopic arm device according to claim 1, wherein said outer tube is formed in an angular tube shape having a cross-section configuration of a hexagonal shape including a rear surface attached to a distal end side of said boom, a front surface facing said rear surface in the front-rear direction, a left side surface (13C) and a right side surface that are opposed to each other in the left-right direction having said rear surface and said front surface therebetween, a left inclined surface arranged to be obliquely inclined between said rear surface and said left side surface, and a right inclined surface arranged to be obliquely inclined between said rear surface and said right side surface.

8. The multistage telescopic arm device according to claim 1, wherein pushing mechanisms are provided between said outer tube and a first-stage inner tube positioned in the outermost side among said multistage inner tubes, said pushing mechanisms pushing in said first-stage inner tube in the extension direction at the time of extending said first-stage inner tube from said outer tube by said telescopic cylinder,

said pushing mechanisms respectively includes:

pushing fixed sheaves provided in said outer tube to be positioned in a lower part side of said outer tube ;

pushing movable sheaves provided in said sheave mounting member in a lower position than said arm extension movable sheaves; and

pushing ropes one end side of each of which is fixed to said outer tube, the other end side of each of which is fixed to said first-stage inner tube through an inside of said outer tube, and a midway section of each of which is wound around each of said pushing fixed sheaves and each of said pushing movable sheaves,

sheave mounting openings are provided in the lower part side of said outer tube and in positions where said pushing fixed sheaves are provided, and

a part of each of the pushing fixed sheaves is arranged inside of said outer tube through each of said sheave mounting openings.

9. A deep digging excavator including an automotive vehicle body, a boom liftably provided on said vehicle body , and a multistage telescopic arm device provided in a distal end side of said boom,

wherein said multistage telescopic arm device comprising:

a telescopic arm that includes an outer tube extending in the upper-lower direction and multistage inner tubes accommodated inside of said outer tube to be extensible in the length direction;

a telescopic cylinder that is arranged along the length direction of said outer tube configuring part of said telescopic arm;

arm extension fixed sheaves that are fixedly provided on said outer tube;

a sheave mounting member that is mounted on said telescopic cylinder and movably supported to said outer tube in the length direction of said outer tube in such a manner as to come close to or be away from said arm extension fixed sheaves;

arm extension movable sheaves that are provided on said sheave mounting member; and

arm extension ropes one end side of each of which is fixed to said outer tube, the other end side of each of which is fixed to an innermost inner tube among said inner tubes, and a midway section of each of which is wound around each of said arm extension fixed sheaves and each of said arm extension movable sheaves, characterized in that:

said telescopic cylinder comprises a hydraulic cylinder including a tube, and a rod one side of which is fixed to a piston in said tube and the other side of which projects outside from said tube;

a distal end part of said rod is attached to said outer tube of said telescopic arm in a state where said rod of said telescopic cylinder faces upward and said tube of said telescopic cylinder is formed to be movable in the length direction of said outer tube; and

said sheave mounting member is mounted to said tube of said telescopic cylinder.