Octopus Shaped Robot for Facade Cleaning

Description

Technical Field

This invention relates to performing facade cleaning services and has the following specifications:

(1) This invention comprises of the "Octopus Shaped Robot for Facade Cleaning" and five pieces of accessories together with a control unit. The accessories are two maneuvering winch units, one power supply and cleaning fluid supply winch unit, and two counterbalancing winch units.

(2) This invention uses robotic arm on the "Octopus Shaped Robot for Facade Cleaning" to brush clean facade surfaces.

(3) This invention has six robotic clawing arms on the "Octopus Shaped Robot for Facade Cleaning" to overcome obstacles while the "Octopus Shaped Robot for Facade Cleaning" is translating along facade faces by two maneuvering winch units (accessories).

(4) This invention caters for simple façade and intricate façade by providing two versions of clawing arms with one version's arm resembling the human being's arm and forearm and the other version's arm resembling the spider's femur, tibia, and metatarsus.

(5) This invention has uninterrupted electric power supply and cleaning fluid supply from a power supply and cleaning fluid supply winch unit (accessory) to allow cleaning task to be carried out continuously.

(6) This invention has two maneuvering winch units (accessories) to translate the "Octopus Shaped Robot for Facade Cleaning" along facade faces vertically or horizontally.

(7) This invention has a multi-purpose bow pantograph arm on the "Octopus Shaped Robot for Facade Cleaning" to hook up with two wire ropes coming from the two maneuvering winch units (accessories) and the electric cable and cleaning fluid hose from the power supply and cleaning fluid supply winch unit (accessory).

(8) This invention has two counterbalancing winch units (accessories) hook up with the "Octopus Shaped Robot for Facade Cleaning" working together with two inclined inline centrifugal blowers within the "Octopus Shaped Robot for Facade Cleaning" to keep the "Octopus Shaped Robot for Facade Cleaning" lean against the facade to perform cleaning tasks on vertical facades, curved facades, and non-vertical acute angled facades and obtuse angled facades.

The above eight unique specifications together differentiates this invention from most other prior arts.

Background

Nowadays, facade cleaning is mostly done by deploying human beings working on gondolas hanging outside building facades. There is also using drones spraying cleaning fluids onto the facade faces to perform cleaning task. And in domestic scale, small robots with sucking head attaching itself to the outer face of a window glass is used to clean the exterior of that particular window glass.

Deploying human beings on gondolas is known to be potentially unsafe to the cleaning workers. Besides, the use of gondolas can only work on vertical facades because curved facades, non-vertical acute angled facades and non-vertical obtuse angled facades can hardly be reached by using gondolas. What can be done on such facades could possibly be having workers on scaffolding which is costly, time consuming and, not to mention, has potential safety hazards to the scaffolding workers setting up and dissembling the scaffolding and the cleaning workers working on the scaffolding.

Naturally, cleaning by using this invention, being unmanned, does not have any potential safety hazards to human cleaners. Besides, this invention, possessing maneuvering winch units, counterbalancing winch units and inclined inline centrifugal blowers, can have the "Octopus Shaped Robot for Facade Cleaning" lean on almost all shapes of facades, including non-vertical acute angled and obtuse angled facades, to provide servicing. Most importantly, the "Octopus Shaped Robot for Facade Cleaning" has clawing robotic arms to overcome obstacles encountered on facade faces while translating horizontally or vertically. Catering for simple façade and intricate façade, this invention provides two versions of clawing arms. Therefore, this invention can be said to be outperforming the use of gondolas.

The use of drones sounds like a feasible replacement to human beings on gondolas but drones have to be recharged from time to time and therefore cannot perform cleaning tasks continuously and uninterruptedly. Besides, cleaning is not thorough if the cleaning fluids are only sprayed on the facade without brushing the facade faces. On the other hand, this invention has independent uninterrupted electricity supply and cleaning fluid supply to provide continuous cleaning task and has a robotic arm carrying brushes to perform brush cleaning. Therefore, this invention provides a quicker and better cleaning result than using drones.

As for domestic type window glass cleaning robot, it is not a competitor to this invention at all because such devices can only be worked on the exterior of the glasses with an openable window, not the entire facade.

Therefore, this invention is a solution to safely cleaning facades of different shapes continuously and uninterruptedly and because it is unmanned, there is no potential safety hazard to the operating workers. This invention outperforms most prior arts.

Brief Description of Figures

The Octopus Shaped Robot for Facade Cleaning

Figure 1

"Octopus Shaped Robot for Facade Cleaning" with arms resembling human being's arm and forearm and five pieces of accessories for simple facades

- Upper left to right: maneuvering winch unit, power supply and cleaning fluid supply winch unit and maneuvering winch unit
- Middle: Octopus Shaped Robot for Facade Cleaning (for simple façades)
- Lower: two counterbalancing winch units

Figure 2

"Octopus Shaped Robot for Facade Cleaning" with arms resembling spider's femur, tibia, and metatarsus and five pieces of accessories for intricate facades

- Upper left to right: maneuvering winch unit, power supply and cleaning fluid supply winch unit and maneuvering winch unit
- Middle: Octopus Shaped Robot for Facade Cleaning (for intricate façades)
- Lower: two counterbalancing winch units

Figure 3

Upper right front isometric view of the "Octopus Shaped Robot for Facade Cleaning" (for simple façades) having arms resembling the human being's arm and forearm (upper figure) and the "Octopus Shaped Robot for Facade Cleaning" (for intricate façades) having arms resembling the spider's femur, tibia, and metatarsus (lower figure)

(Please use this figure as the accompanying figure when published)

Figure 4

Upper left rear isometric view of the "Octopus Shaped Robot for Facade Cleaning" having arms resembling the human being's arm and forearm (upper figure) and the "Octopus Shaped Robot for Facade Cleaning" having arms resembling the spider's femur, tibia, and metatarsus (lower figure)

Figure 5

Maneuvering winch unit

Figure 6

Power supply and cleaning fluid supply winch unit

Figure 7

Counterbalancing winch unit

Figure 8

Octopus Shaped Robot for Facade Cleaning with arms resembling human being's arm and forearm working on vertical façade (upper figure) and Octopus Shaped Robot for Facade Cleaning with arms resembling the spider's femur, tibia, and metatarsus working on vertical façade (lower figure)

Figure 9

Octopus Shaped Robot for Facade Cleaning with arms resembling human being's arm and forearm working on non-vertical acute angled façade (upper figure) and non-vertical obtuse angled façade (lower figure)

Figure 10

Octopus Shaped Robot for Facade Cleaning with arms resembling spider's femur, tibia, and metatarsus working on non-vertical acute angled façade (upper figure) and non-vertical obtuse angled façade (lower figure)

Embodiment

The Invention

This invention, the "Octopus Shaped Robot for Facade Cleaning" comes with five accessories. They are, namely, two maneuvering winch units and one power supply and cleaning fluid supply winch unit mounted above the area of the facade to be cleaned (normally the roof top), and two counterbalancing winch units placed below the area of the facade to be cleaned (normally ground level or podium level). All these accessories are hooked up to the "Octopus Shaped Robot for Facade Cleaning" to perform cleaning task.

During operation, the six robotic clawing arms of the "Octopus Shaped Robot for Facade Cleaning" and the maneuvering winch units work together to translate the "Octopus Shaped Robot for Facade Cleaning" along facade faces, overcoming any obstacles encountered; the power supply and cleaning fluid supply winch unit provides uninterrupted continuous electricity supply and cleaning fluid supply to power the "Octopus Shaped Robot for Facade Cleaning" and for the cleaning robot arm of the "Octopus Shaped Robot for Facade Cleaning" to perform cleaning task; and the counterbalancing winch units and the inclined inline centrifugal blowers within the "Octopus Shaped Robot for Facade Cleaning" work together to keep the "Octopus Shaped Robot for Facade Cleaning" lean against facade face, whether, vertical, acute angled or obtuse angled.

How to carry out the invention

This invention can be used on facade of any shapes, vertical, acute angled or obtuse angled: as follows:

(1) First of all, the five accessories have to be in position; the two maneuvering winch units and the power supply and the cleaning fluid supply winch unit (three accessories) will need to be first mounted on the roof top of the building or any level above where cleaning is required and the two counterbalancing winch units (two accessories) placed on the ground level or any level below where cleaning is required.

(2) Using the multi-purpose bow pantograph arm of the "Octopus Shaped Robot for Facade Cleaning", the "Octopus Shaped Robot for Facade Cleaning" will then be hung outside the facade by using two wire ropes running down from the two maneuvering winch units and coupled to the electric cable and cleaning fluid hose from the power supply and cleaning fluid supply winch unit.

(3) The next thing to do is to have the "Octopus Shaped Robot for Facade Cleaning" tied to the two counterbalancing winch units using two wire ropes connecting to the bottom part of the "Octopus Shaped Robot for Facade Cleaning".

(4) It is important to note that the two inclined inline centrifugal blowers within the "Octopus Shaped Robot for Facade Cleaning" should be working all the time to help keep the "Octopus Shaped Robot for Facade Cleaning" to lean against the facade.

(5) After all the accessories are hooked up and inclined inline centrifugal blowers turned on, the "Octopus Shaped Robot for Facade Cleaning" can then be translated to designated area of a facade where cleaning is required.

(6) By controlling the wire rope of one maneuvering winch unit to descend and the wire rope of the other maneuvering winch unit to ascend, the "Octopus Shaped Robot for Facade Cleaning" can be made to traverse sideway horizontally along the façade surface. To overcome any obstacles encountered while traversing on the facade, the six robot arms of the "Octopus Shaped Robot for Facade Cleaning" work coordinately to claw over such obstacles.

(7) Correspondingly, by ascending or descending the wire ropes of both maneuvering winch units in a coordinated way, the "Octopus Shaped Robot for Facade Cleaning" can be made to move up or down along the façade surface. Naturally, the six clawing robot arms have to work in coordination as well to overcome obstacles that may be encountered.

(8) While the "Octopus Shaped Robot for Facade Cleaning" is moving either vertically or horizontally by the maneuvering winch units, the tension sensor within each of the two counterbalancing winch units monitoring the tension of its wire rope connecting to the "Octopus Shaped Robot for Facade Cleaning" will instruct that counterbalancing winch unit to wind or unwind the wire rope accordingly so as to maintain a predetermined wire rope tension to keep the "Octopus Shaped Robot for Facade Cleaning" lean against the facade face.

(9) At the same time when the "Octopus Shaped Robot for Facade Cleaning" is moving to a new position, the lengths of the electric cable and the cleaning fluid hose connecting the "Octopus Shaped Robot for Facade Cleaning" to the power supply and cleaning fluid supply winch unit should be lengthened or shortened as well. This is done by the tension sensors within the "Octopus Shaped Robot for Facade Cleaning" monitoring the tension of the electric cable and the cleaning fluid hose and sending signals to the power supply and cleaning fluid supply winch unit to wind or unwind the electric cable and the cleaning fluid hose respectively.

(10) Cleaning will then begin by using the robotic cleaning arm.

(11) After cleaning a certain area, steps 6 through 10 will repeat to clean other designated facade face.

To consolidate, the "Octopus Shaped Robot for Facade Cleaning" has continuous electricity supply and cleaning fluid supply for uninterrupted operation, has robotic arm to perform brush cleaning of facade faces, has robotic arms to help claw over obstacles while translating along the facade faces by the two maneuvering winch units, and has blowers working in conjunction with counterbalancing winch units to keep itself lean against facade of any shape, vertical, curved, acute angled, or obtuse angled.

Claims

1. This invention is characterized by having an "Octopus Shaped Robot for Facade Cleaning" and five pieces of accessories, namely, two maneuvering winch units, one power supply and cleaning fluid supply winch unit and two counterbalancing winch units
2. This invention is characterized in that the "Octopus Shaped Robot for Facade Cleaning" embodies six robotic clawing arms, one robotic cleaning arm, one multi-purpose bow pantograph arm and two inclined inline centrifugal blowers.
3. This invention is characterized in that the "Octopus Shaped Robot for Facade Cleaning" is electric powered and cleaning fluid supplied by a power supply and cleaning fluid supply winch unit.
4. This invention is characterized in that the "Octopus Shaped Robot for Facade Cleaning" is maneuvered vertically and/or horizontally by using two maneuvering winch units.
5. This invention is characterized by using six clawing robotic arms on the "Octopus Shaped Robot for Facade Cleaning" to overcome obstacles encountered while maneuvering along a facade face.
6. This invention is characterized in that there are two versions of clawing arms on the Octopus Shaped Robot for Façade Cleaning to cater for simple façades and intricate facades respectively.
7. This invention is characterized in that each of the clawing arms of the version of the Octopus Shaped Robot for Façade Cleaning for simple facades has two moving elements resembling the human being's arm and forearm.
8. This invention is characterized in that each of the clawing arms of the version of the Octopus Shaped Robot for Façade Cleaning for intricate facades has three moving elements resembling the spider's femur, tibia, and metatarsus.
9. This invention is characterized in that the "Octopus Shaped Robot for Facade Cleaning" leans against the facade face by two inclined inline centrifugal blowers within the "Octopus Shaped Robot for Facade Cleaning" and two counterbalancing winch units and that the winding and unwinding of the wire ropes of the two counterbalancing winch units is automatically controlled by sensors installed inside the counterbalancing winch units
10. This invention is characterized in that winding and unwinding of the electric cable and cleaning fluid hose connecting from the power supply and cleaning fluid supply winch unit to the "Octopus Shaped Robot for Facade Cleaning" is automatic by using sensors installed within the "Octopus Shaped Robot for Facade Cleaning"

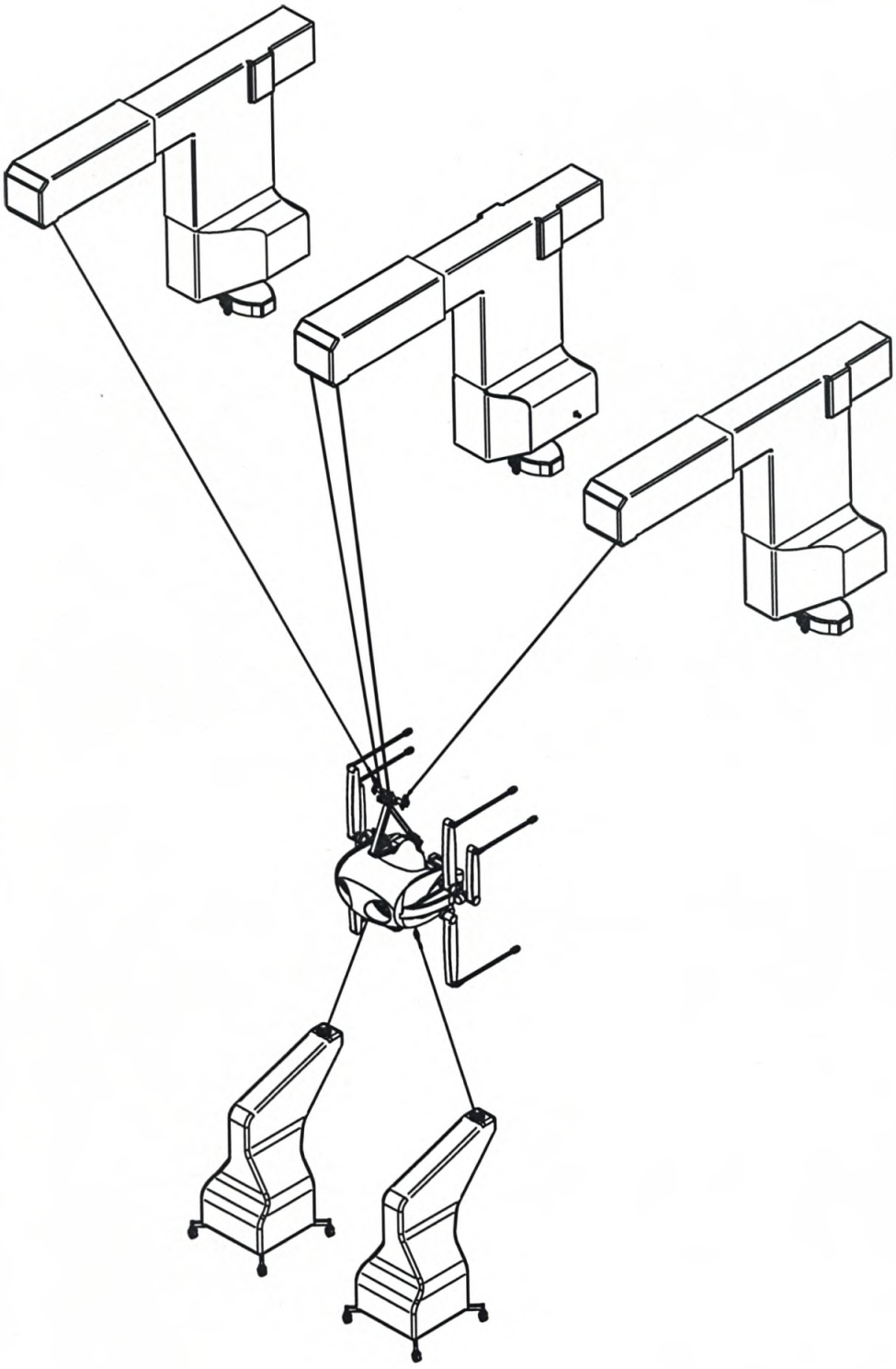


FIGURE 1

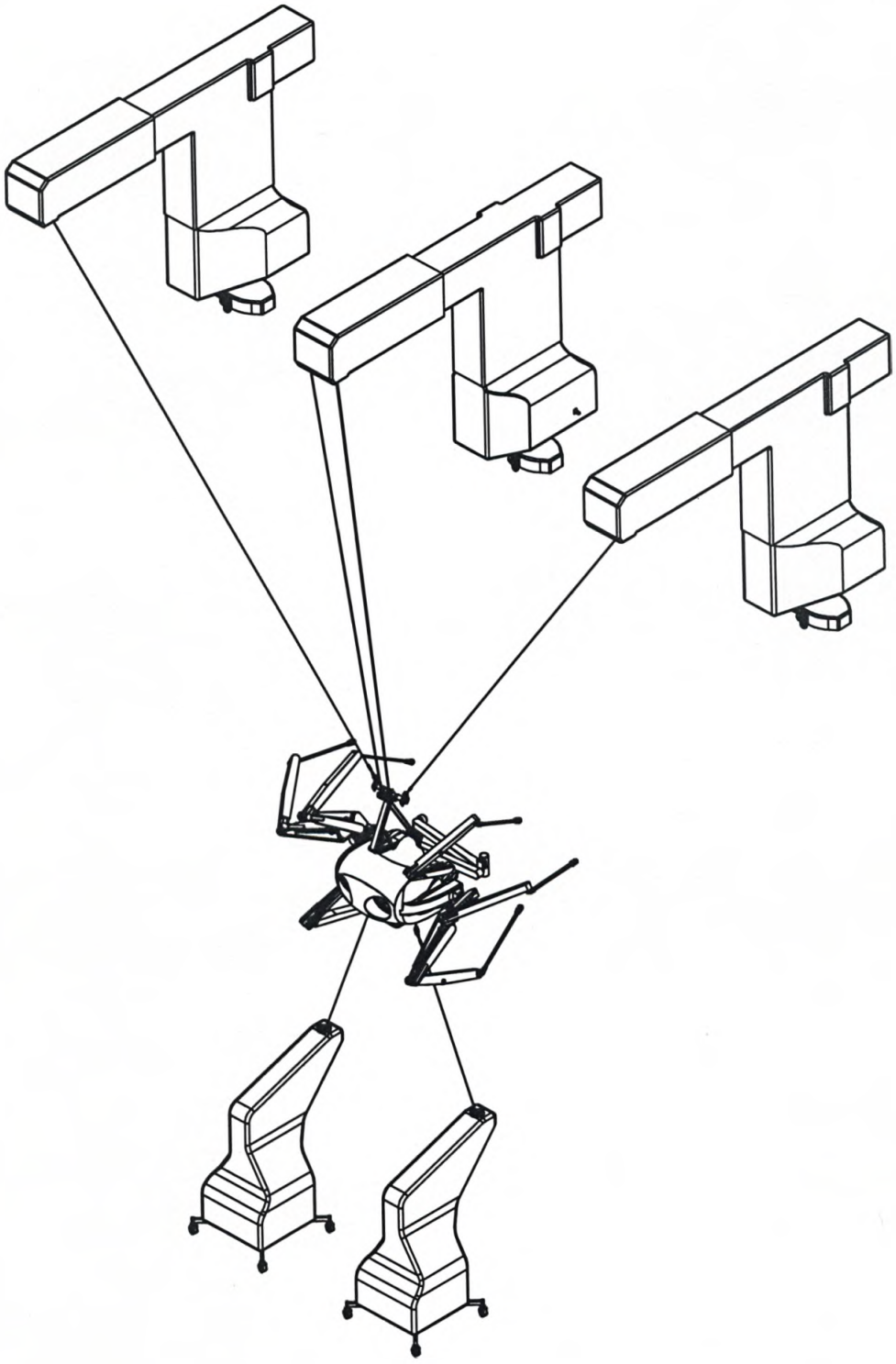
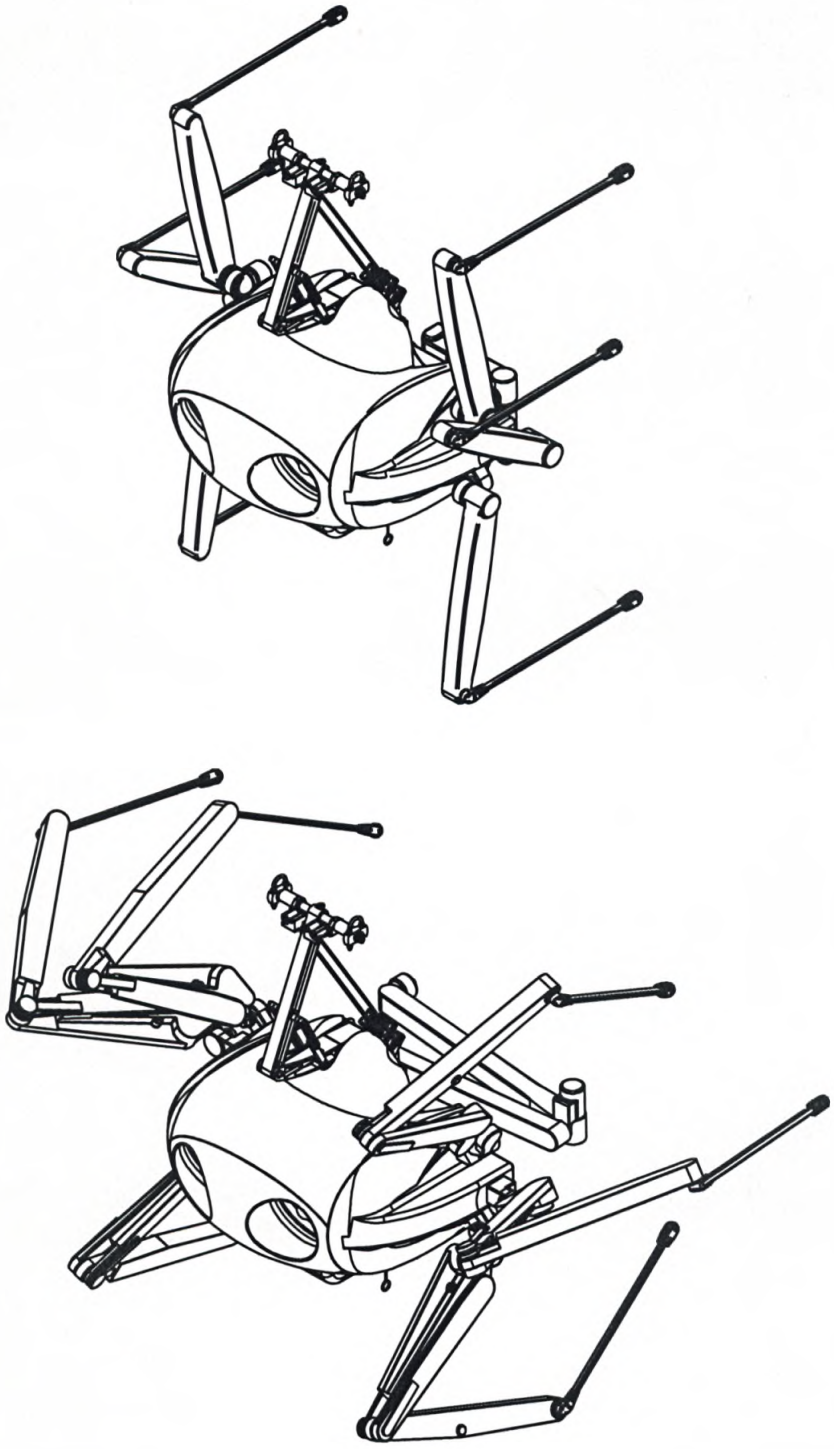


FIGURE 2



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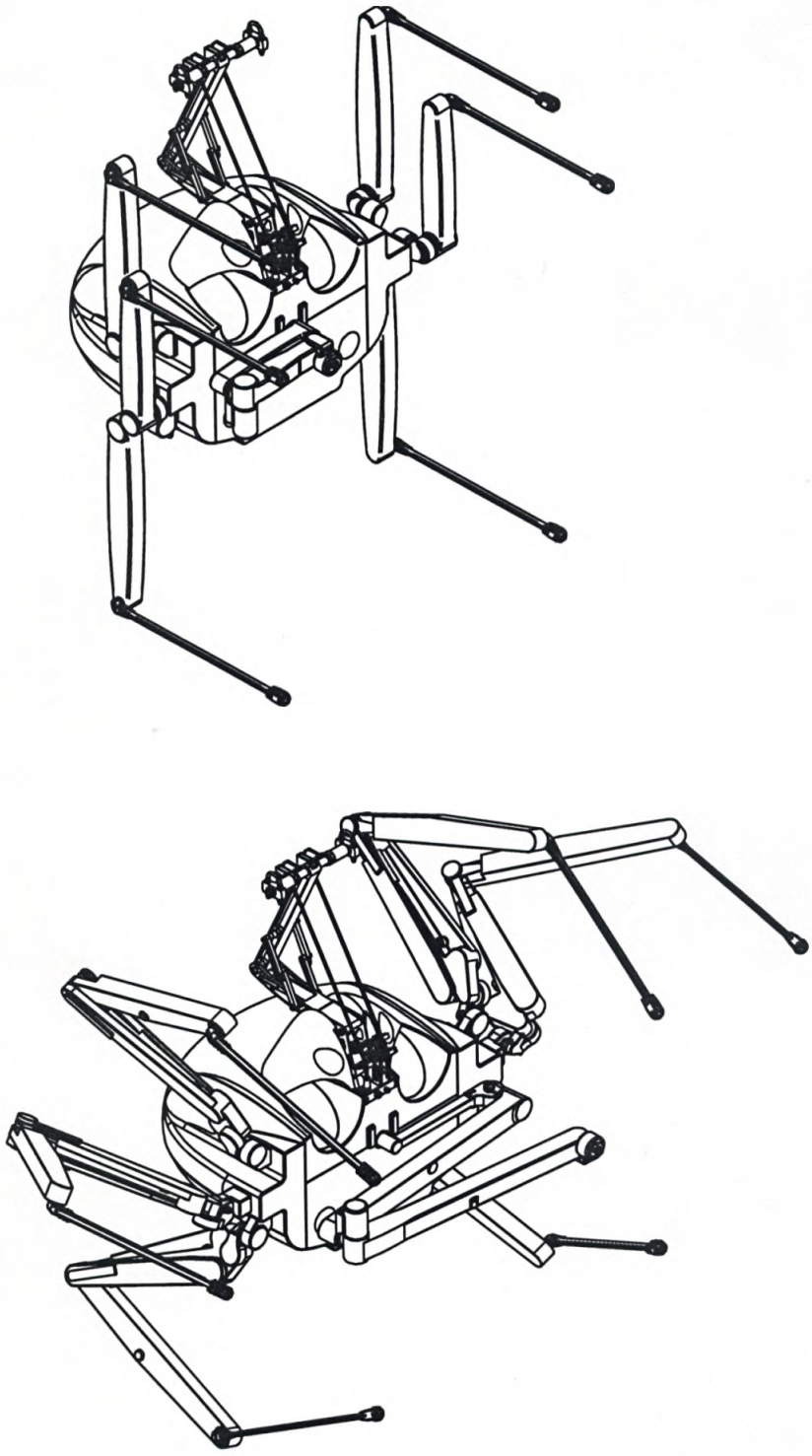

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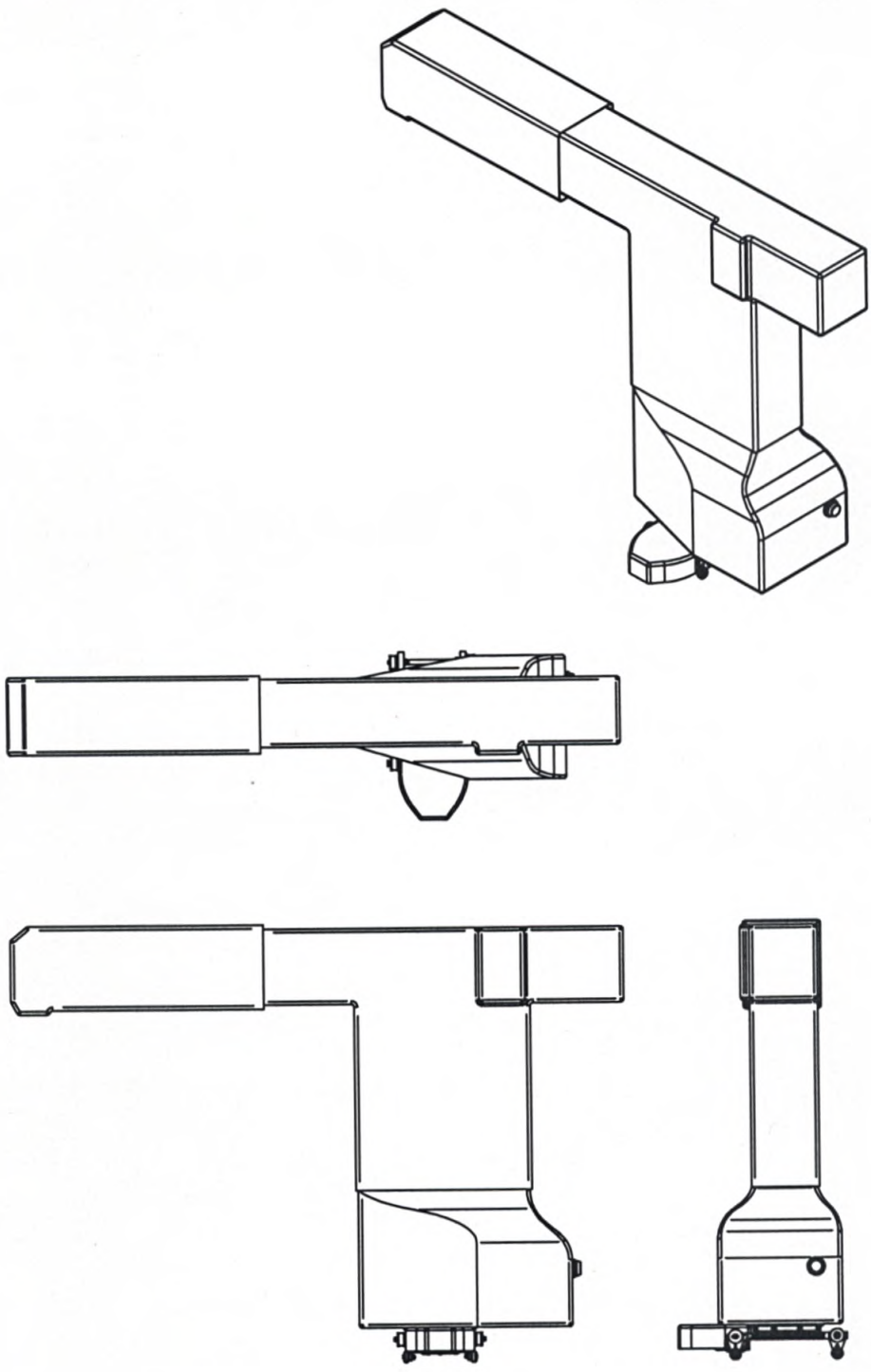

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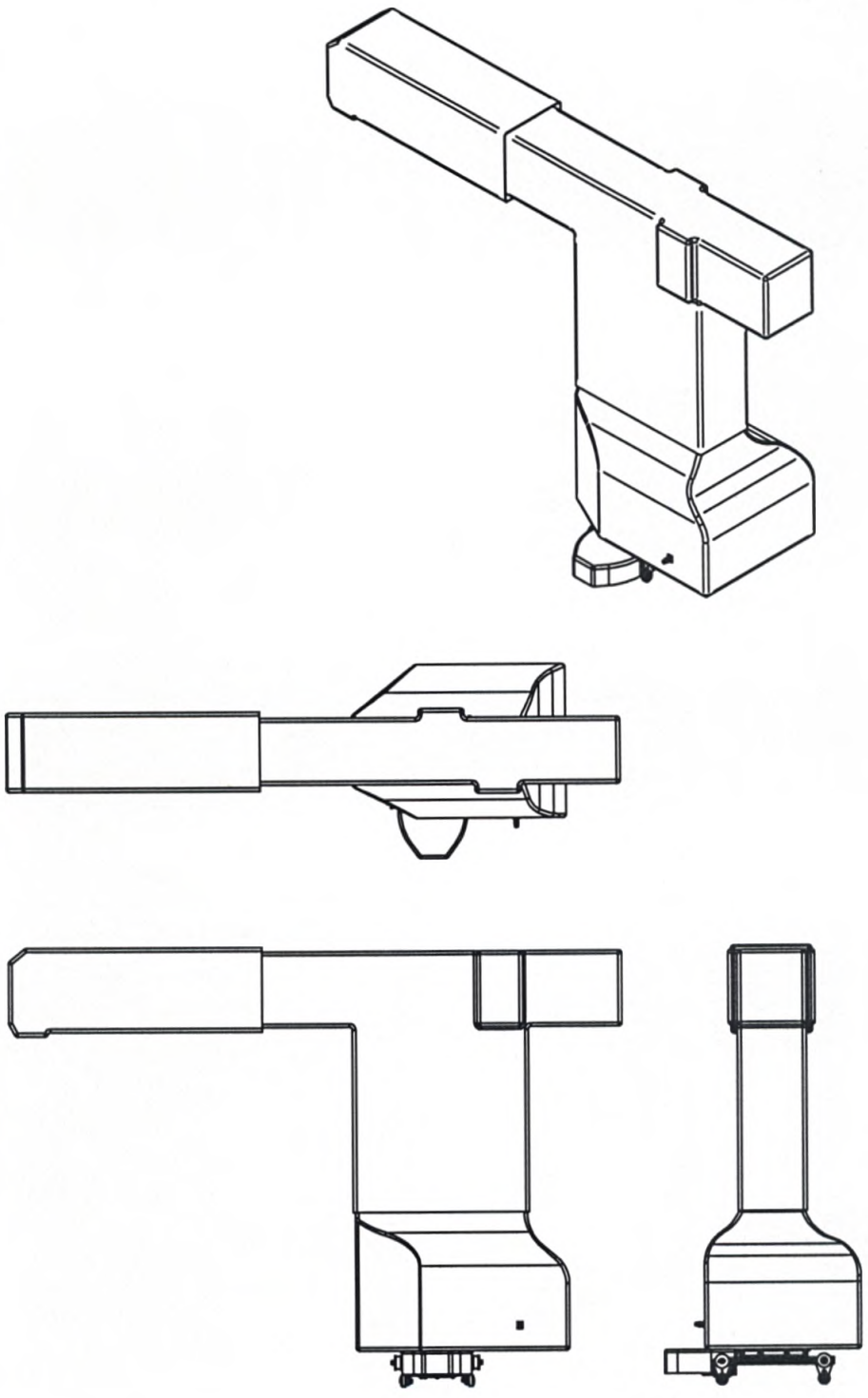

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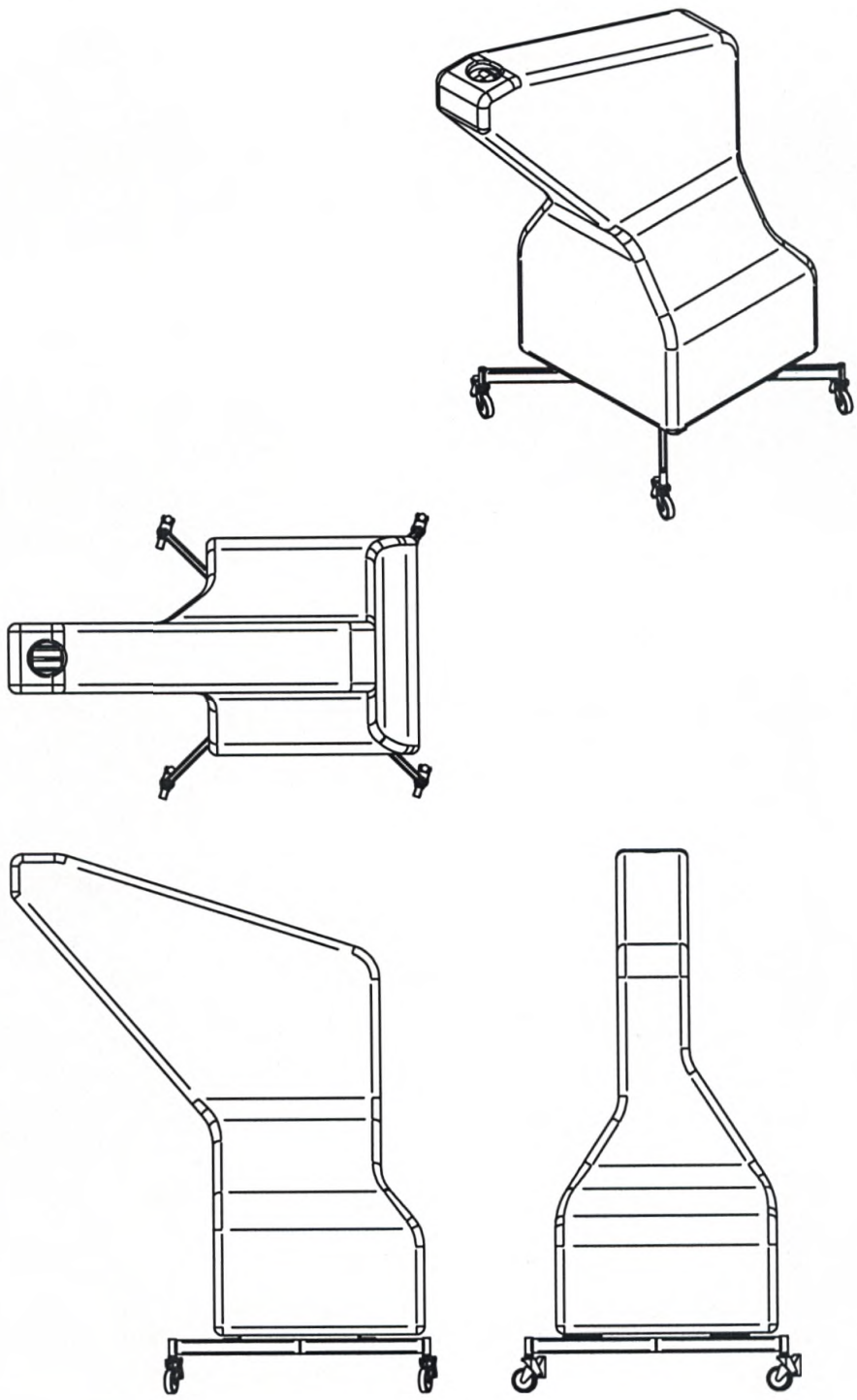

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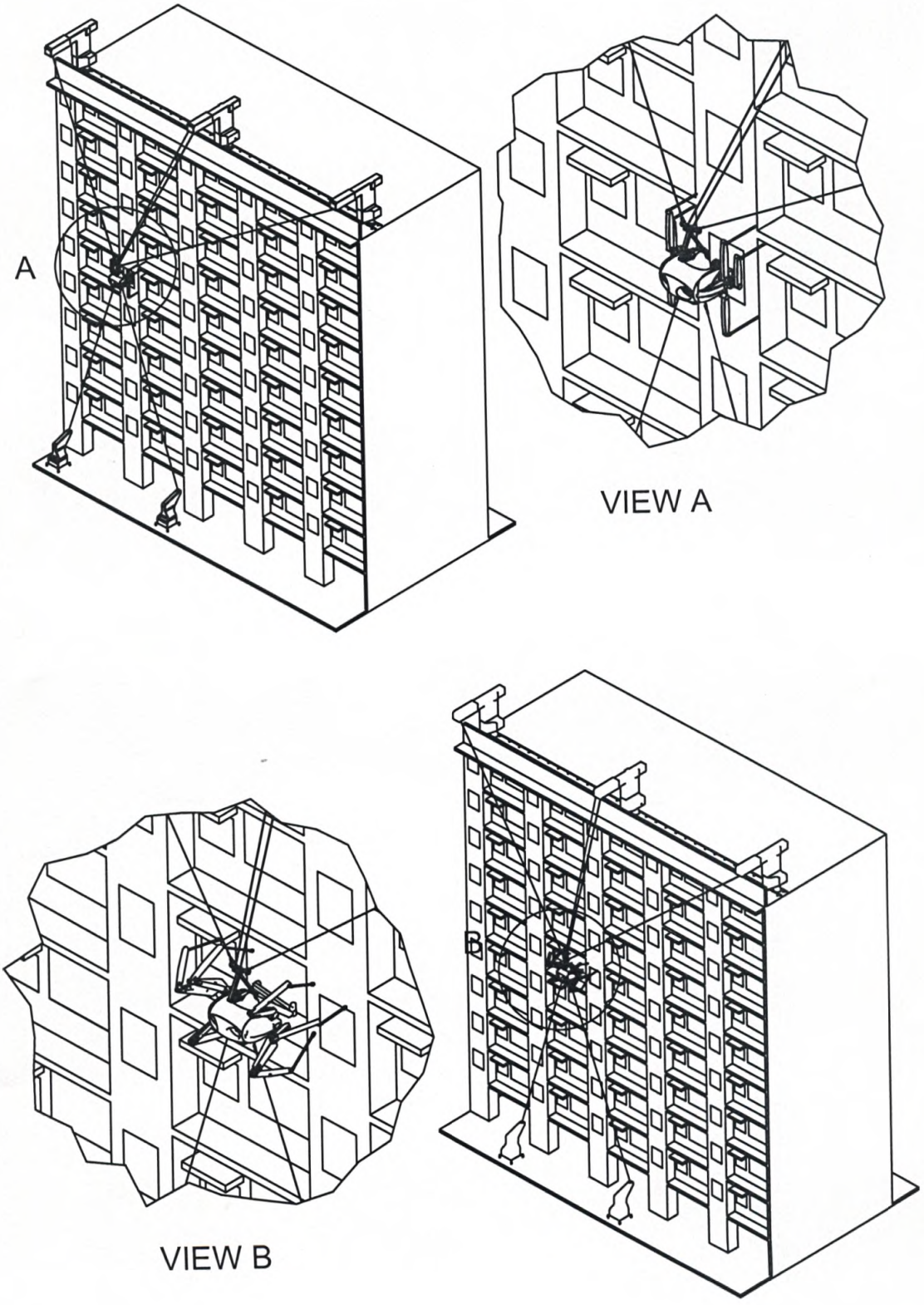

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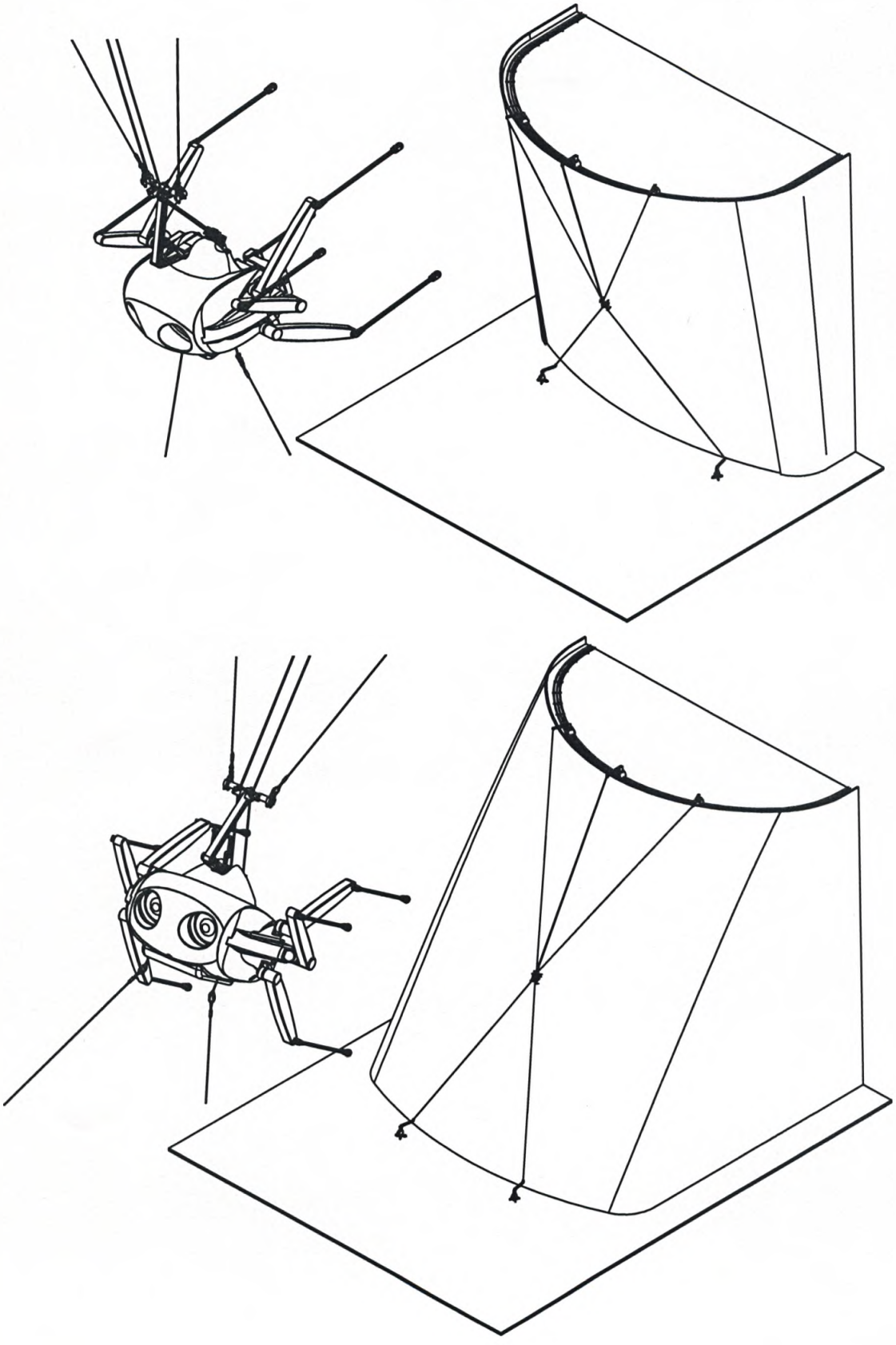

FIGURE 9

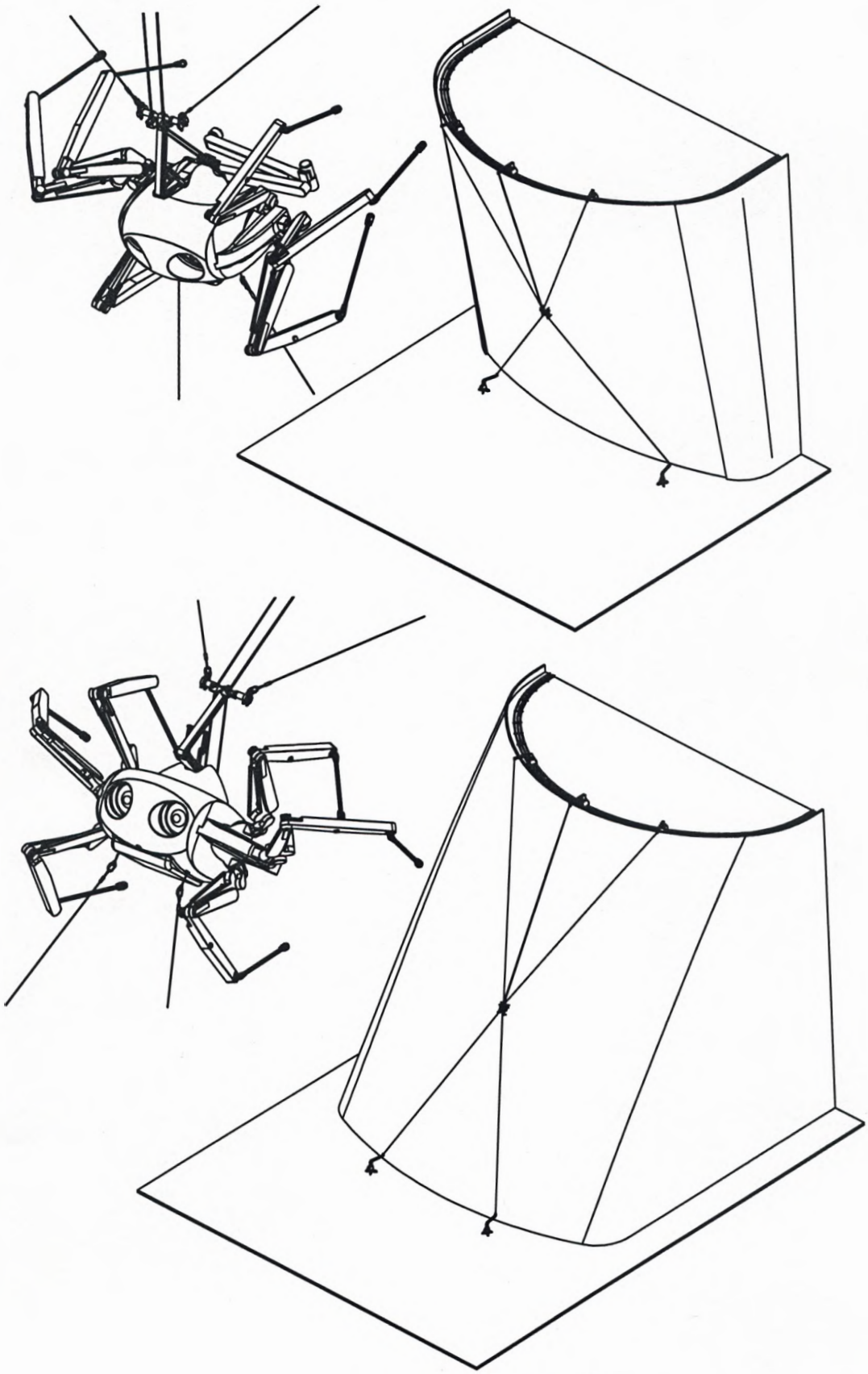

FIGURE 10