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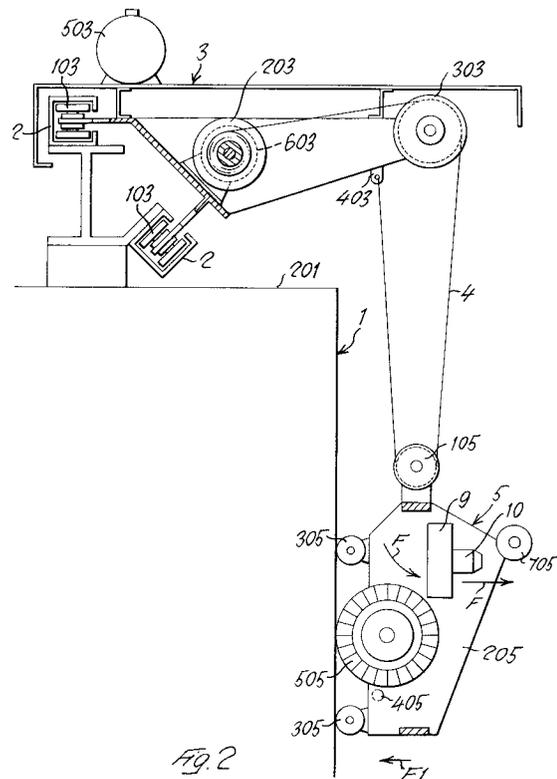
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**Apparatus for cleaning the outer surfaces of buildings.**

Apparatus for cleaning the outer walls of buildings, equipped with means for cleaning and washing the walls. Said apparatus is suspended from a carriage (3) which is provided with means capable of causing both a displacement of said carriage in a vertical plane along the walls to be cleaned, and a translation thereof in a horizontal plane along the perimeter of the building. Said apparatus (5) is provided with screw- and/or turbine propulsion means (8) capable of keeping it constantly adhering against the surface to be cleaned, the airflow generated by said means (8) being used to dry the washed surfaces.



**EP 0 541 951 A1**

The present invention relates to the cleaning of the outer surfaces which coat buildings, and more particularly it relates to an apparatus for cleaning said coating surfaces, either vertical or inclined, plain or moulded, made of glass or other materials, on buildings or other structures.

It is known that it has become more and more diffused the use in the building technique of coatings made of glass or other materials such as metal plates, marble, etc., either with or without an outer supporting structure, and especially in the last-mentioned case the necessity has arisen to devise an apparatus for cleaning them.

At present, for cleaning said surfaces, a traditional system is used, consisting of lowering a cable-suspended bridge from the roof, supporting the working personnel, or arranging along the walls of the building guides or cables or similar vertical or horizontal means, either fixed on the surfaces to be treated or arranged in place at the moment of use, which are designed to guide and maintain the suitable adherence engagement between the walls and the devices carrying the means for mechanically cleaning said walls.

All these known systems are expensive and difficult to be put in place, whereby the maintenance of the walls of said buildings becomes a complicate time-consuming and tiresome operation.

Therefore, the main object of the present invention is to provide a system and apparatus for cleaning the outer walls of buildings of the type mentioned above, capable of overcoming the disadvantages and drawbacks of the known systems, eliminating specifically the necessity of any type of longitudinal and transversal anchorage of the cleaning apparatus to be arranged on the walls to be acted upon, while ensuring a perfect adhesion of the cleaning apparatus to the surface to be treated, even if they are of considerable height, moulded and/or inclined.

According to a primary characteristic of the present invention, said object is achieved by providing an apparatus for cleaning the outer, vertical or sub-vertical walls of buildings or other structures, and more particularly for cleaning the covering walls made of glass, marble or metal, of buildings, said apparatus being provided with mechanical cleaning means and/or steam jet cleaning means and/or liquid jet cleaning means for washing the walls, characterized in that it comprises a carriage mounted on a portion of the roof of the building to be cleaned and provided with suspension means for suspending said apparatus and capable of causing said apparatus to be displaced in a vertical plane along the walls of the building to be cleaned, and with means capable of causing said apparatus to be displaced in the horizontal

plane along the entirety or a portion of the perimeter of the building to be cleaned, said apparatus being provided with screw-and/or turbine propulsion means capable of constantly keeping it positively adhering against the surface being cleaned.

Advantageously, according to a further characteristic of the invention, said adhering action of the cleaning apparatus against the wall to be cleaned is enhanced further by suspending the apparatus from said carriage in an eccentric position with respect to its center of gravity, and/or by using suitable counterweights capable of enhancing said adhesion of the apparatus to the wall to be cleaned.

Advantageously, said propulsion means is a screw, or a turbine, or the like, and the airflow generated by said propulsion means to adhere the cleaning apparatus to the surface to be cleaned is used to dry the surfaces which have been treated with the detergent liquid used to clean them.

According to a preferred embodiment, said carriage is mounted on rails extending along the perimeter of the roof of the building, and said propulsion means is operated by electricity, or by compressed air, or by an explosion engine or the like.

Further characteristics and advantages of the present invention will become more apparent from the following detailed description of a preferred embodiment thereof shown by way of a non-limiting example in the accompanying drawings, wherein:

Fig. 1 is a diagrammatic view of a facade of a building supporting the device according to the invention;

Fig. 2 is a diagrammatic elevational and partly sectional view of the device according to the invention applied against the wall of a building;

Fig. 3 is a plan view of the supporting and translating carriage for the cleaning apparatus according to the invention; and

Fig. 4 is a side elevational and partly sectioned view of the cleaning apparatus suspended from the carriage of Fig. 3.

With reference to the drawings, and with particular reference to Figures 1 and 2 thereof, 1 indicates the wall of a building. Said wall, as shown, consists of a series of glass panels 101. Mounted on the roof 201 of the building is a track 2 extending along the entire perimeter of said building. Rolling along the track 2 are the wheels 103 of a two-rail carriage 3. Mounted on the carriage 3 are the capstans 203, on the drums of which there are wound the cables 4 for suspending the cleaning apparatus. Said cables 4 are anchored, at their ends remote from those wound on the capstans 203, to a respective connecting member or hook 403 fixed to the carriage 3, and they are turned

round the pulleys 303 on the carriage 3 and the pulleys 105 wherefrom the cleaning apparatus 5 is suspended at an end. The hook 403 is advantageously offset towards the wall 1 with respect to the center of gravity of the cleaning apparatus 5, so that the apparatus 5 tends to adhere constantly against the surface 1 to be cleaned. This action of apparatus 5 to adhere against wall 1 is further enhanced and increased by the action of counterweights 705, mounted on the side of the apparatus 5 remote from the one facing the wall 1. The capstans 203 are actuated by a motor 603 which in the illustrated instance is an electric motor. A suitable electric motor (not shown) controls the displacement of the carriage 3 along the rails 2. Coupled to the capstans 203 are the winding drums 703 and 803 intended to wind thereon the hose 6 feeding the detergent liquid contained in the tank 503 and the electric cable 7 feeding the electric power to the cleaning apparatus 5, respectively, as described below with more details.

With particular reference to Figures 2 and 4, the cleaning apparatus 5 comprises a carriage 205 which, advantageously, is shielded on five sides and is open on the sixth side where it is provided with idle rubber wheels or rollers 305 by means of which it rests against the panels 101 of the building wall 1. In the interior thereof, it accommodates a manifold 405 which is provided with spray nozzles directed against the wall 1 and is connected to the hose 6 feeding the washing liquid, and a rotating roller brush 505 actuated by the electric motor 605. The roller brush 505 is applied tangentially against the wall 1 to be cleaned. Finally, the cleaning apparatus comprises a fan 8 tubed in a trunk 9 and actuated by an electric motor 10, the blades of the fan 8 being inclined in such a way and rotated in such a direction as to create a suction flow in the direction of the arrow F of Fig. 2, to generate a reaction F1 which keeps the cleaning apparatus 5 constantly adhering against the wall 1 of the building to be cleaned. Both electric motors 10 and 605 are fed through the feeding cable 7.

The operation of the apparatus described above is now apparent.

By displacing the carriage 3 along the rails 2, the cleaning apparatus may be positioned on the vertical of the zone where cleaning is to be effected. In this initial position, the cleaning apparatus 5 will have been preferably hoisted completely up to the maximum height of the building by the capstans 203. The cleaning of the vertical strip of wall concerned by the apparatus 5 is now started. For this purpose, the brush 505 is activated and, simultaneously, cleaning liquid will be fed to the nozzles of the spray manifold 405. At the same time, the fan 8 is activated so as to constantly keep the apparatus 5 adhering against the wall 1 with a

force capable of ensuring a constant engagement of the brush 505 against said wall. Finally, by means of the capstans 203, the apparatus 5 will be lowered vertically along the wall, so that it will be displaced down to the base of said wall 1 by rolling via the rollers 305. During this operation, the airflow sucked by the fan 8 will also contribute to dry the washed area of the wall.

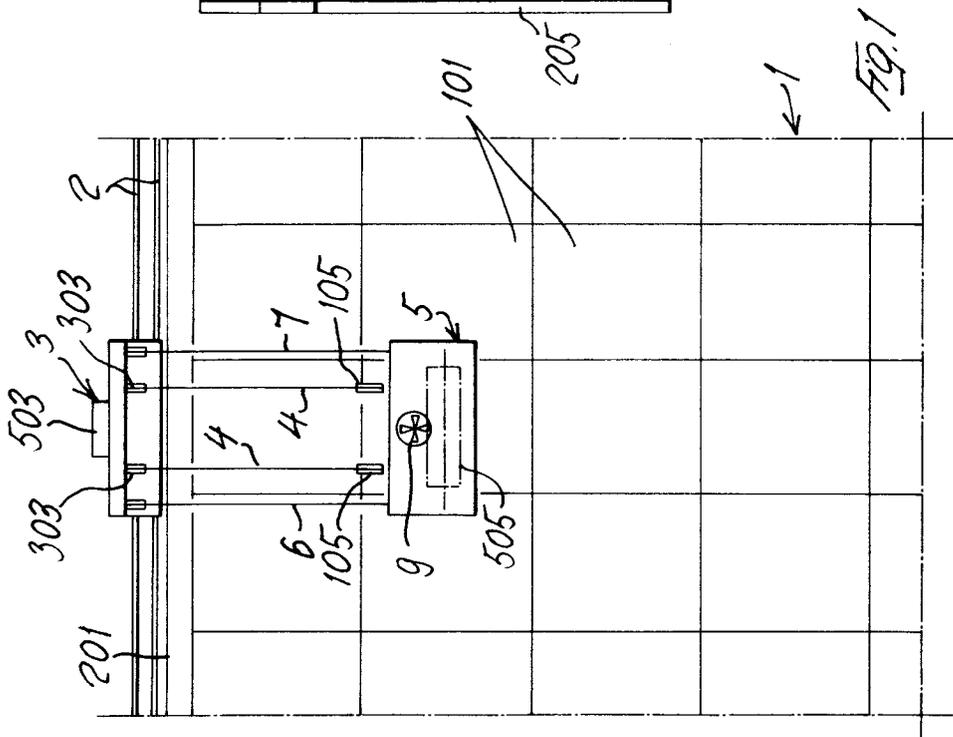
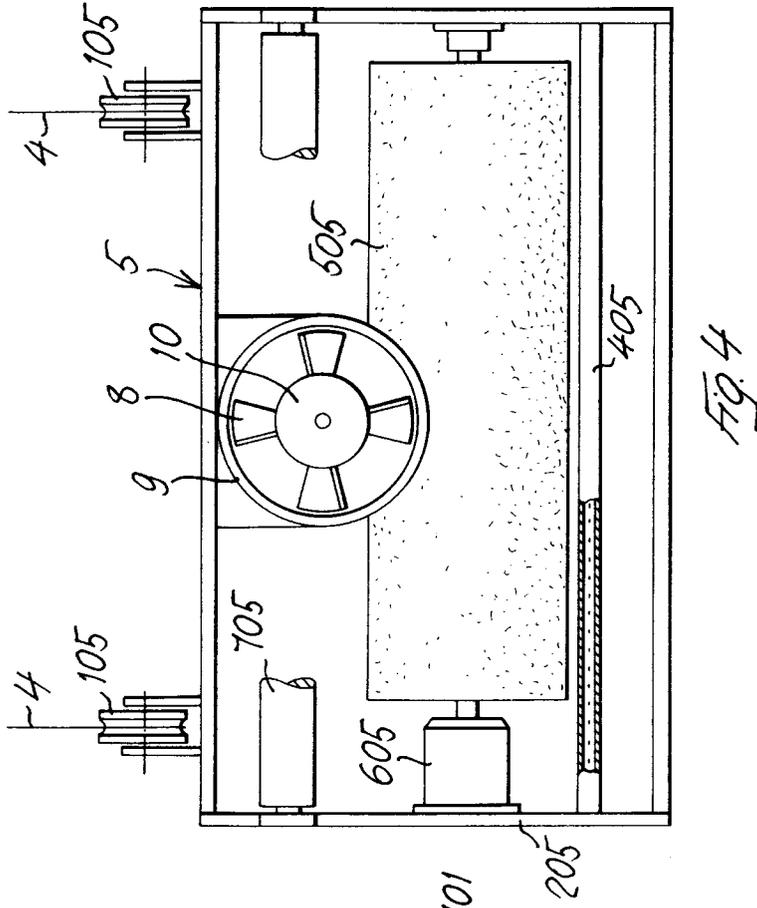
Of course, the invention is not limited to the embodiment described and shown; so, for example, the fan 8 and/or the brush 5 may be actuated by an explosion motor or by a compressed air motor rather than by an electric motor, and a turbine or the like may be used instead of the fan 8. The brush 505 may also be of a type differing from the one shown herein, and the cleaning apparatus 5 may also comprise nozzles capable of issuing jets of superheated steam for cleaning, for example, marble walls or the like.

## Claims

1. An apparatus for cleaning the outer vertical or sub-vertical surfaces of buildings or other structures, and particularly for cleaning the glass, marble or metal covering walls of buildings, provided with cleaning means of mechanical type and/or steam jet type and/or liquid jet type for washing the walls, characterized in that said apparatus comprises a carriage mounted on a portion of roof on the building to be cleaned and provided with suspension means wherefrom said apparatus is suspended and capable of causing said apparatus to be displaced along the walls of the building to be cleaned, and with means capable of causing said apparatus to be displaced in the horizontal plane along the entirety or a portion of the perimeter of the building to be cleaned, said apparatus being provided with propulsion means capable of generating an airstream acting in such a direction as to keep it adhering positively against the wall being cleaned.
2. An apparatus according to claim 1, characterized in that said adhering action against the wall to be cleaned is further enhanced by suspending the apparatus from said carriage in an eccentric position with respect to its center of gravity, and/or by using suitable counterweights capable of enhancing said adhesion of the apparatus to the wall to be cleaned.
3. An apparatus according to the preceding claims, characterized in that said apparatus adheres against the surface to be cleaned with the intermediary of rubber wheels or rollers or

other suitable means permitting the vertical rolling movement of the apparatus along said surface.

4. An apparatus according to the preceding claims, characterized in that said cleaning means arranged on the apparatus comprises means for mechanically treating the surfaces to be cleaned, such as rotating brushes or rotating brush rollers, as well as nozzles for spraying said surfaces with cleaning liquids, such as jets of water mixed with detergents, or jets of steam or the like. 5  
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5. An apparatus according to the preceding claims, characterized in that said propulsion means is a fan or a turbine or the like. 15
6. An apparatus according to claim 5, characterized in that the airstream generated by said propulsion means to keep the cleaning apparatus adhering against the surface to be cleaned is utilized to dry the surfaces treated by the detergent liquid used for cleaning them. 20  
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7. An apparatus according to the preceding claims, characterized in that said carriage is mounted on rails extending along the perimeter of the roof of the building. 30
8. An apparatus according to the preceding claims, wherein said propulsion means is activated by electric power, or by compressed air or by an explosion engine or the like. 35  
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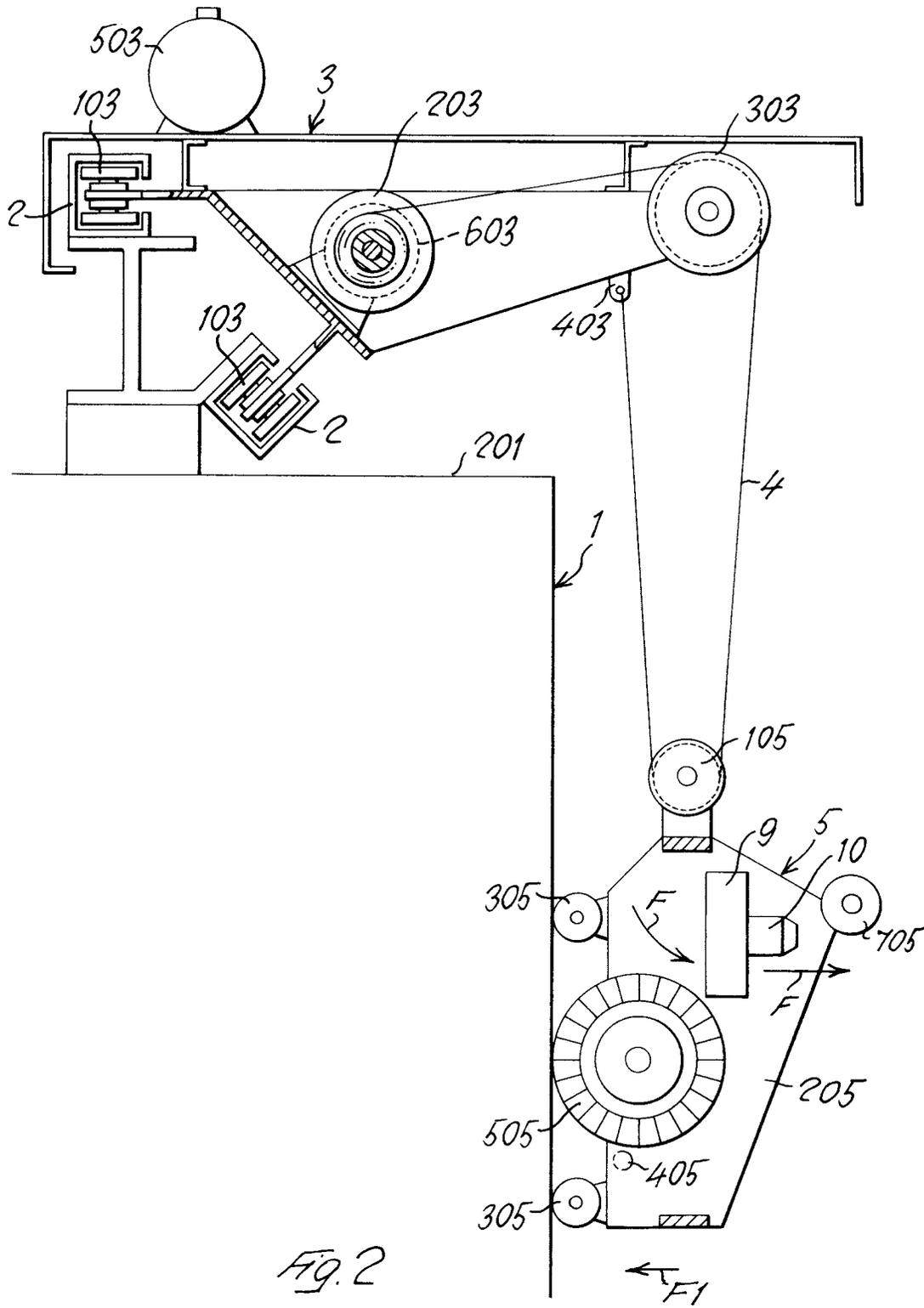
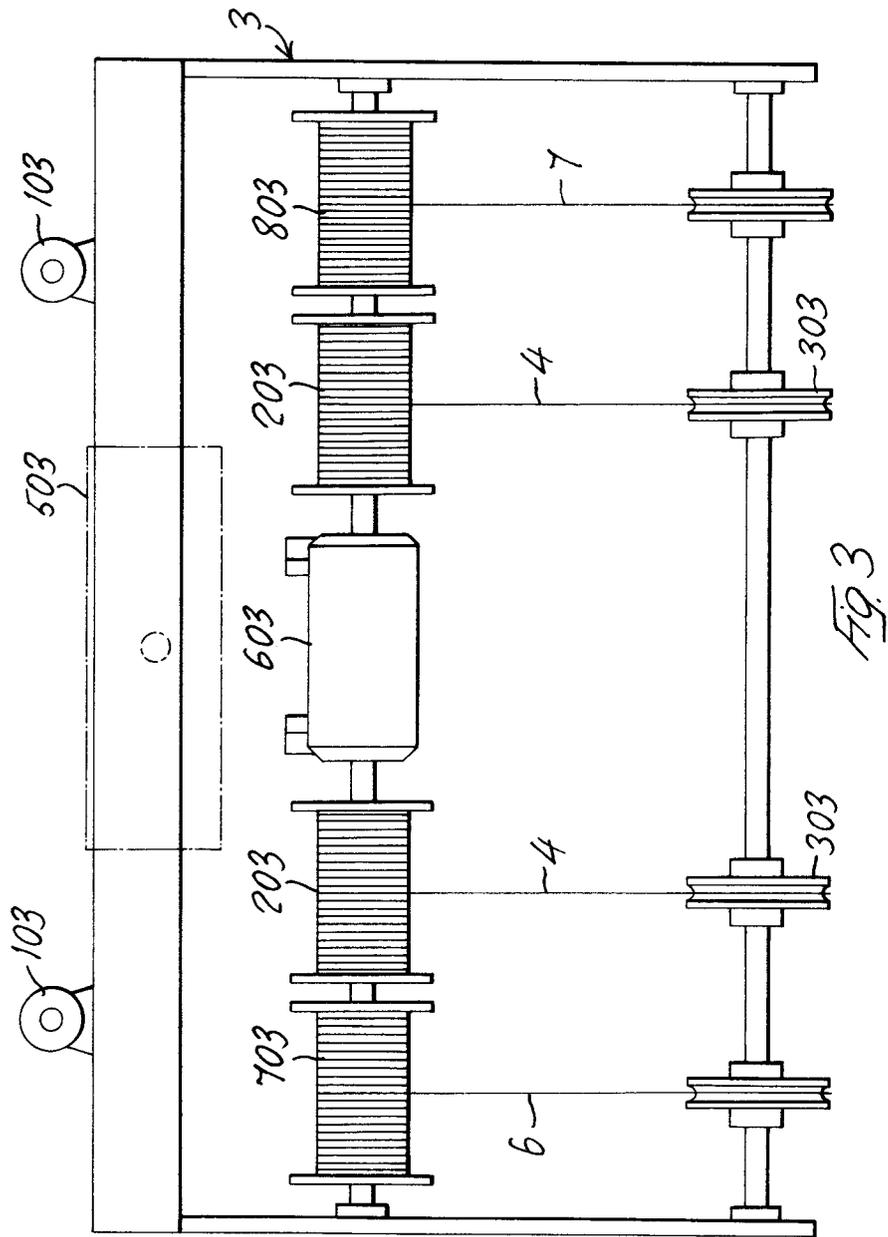


FIG. 2





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 800 607 (FUKITOMI) * column 4, line 46 - column 5, line 33; figures * ---	1,3,4,5	E04G3/00 E04G23/00 A47L1/02
X	DE-U-8 531 513 (GESTA GESELLSCHAFT FÜR STAHLROHRGERÜSTE) * page 6, line 5 - page 7; figures * ---	1,3,5	
X	DE-A-2 207 581 (GROHMANN) * the whole document * ---	1,4,8	
X	FR-A-1 414 659 (THOMANN) * claims; figures * ---	1,5	
A	US-A-3 641 607 (LEMELSON) * column 1- - column 6, line 55; figures * ---	1,4,7,8	
A	US-A-4 120 378 (MILLS) * column 2, line 16 - line 38; figures * ---	2,3	
A	DE-A-3 228 732 (KÄMPKEN) * page 8, paragraph 2; figures * ---	2	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	US-A-4 112 535 (WILD) -----		E04G A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 JANUARY 1993	Examiner VIJVERMAN W.C.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	