Nov. 5, 1968 S. A. SWALLERT 3,409,854

DEVICE FOR MOVING A WORKING APPARATUS ON A SUPPORT SURFACE

Filed May 12, 1966

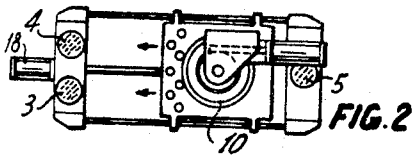

FIG. 2

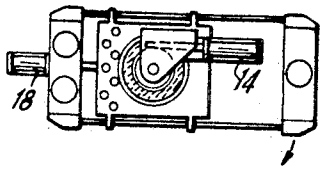

FIG. 3

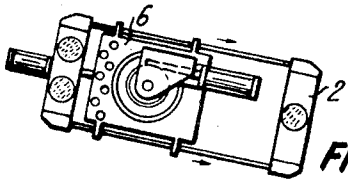

FIG. 4

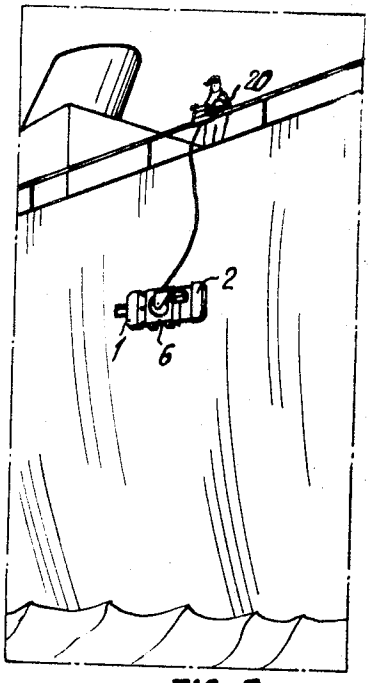

FIG. 5

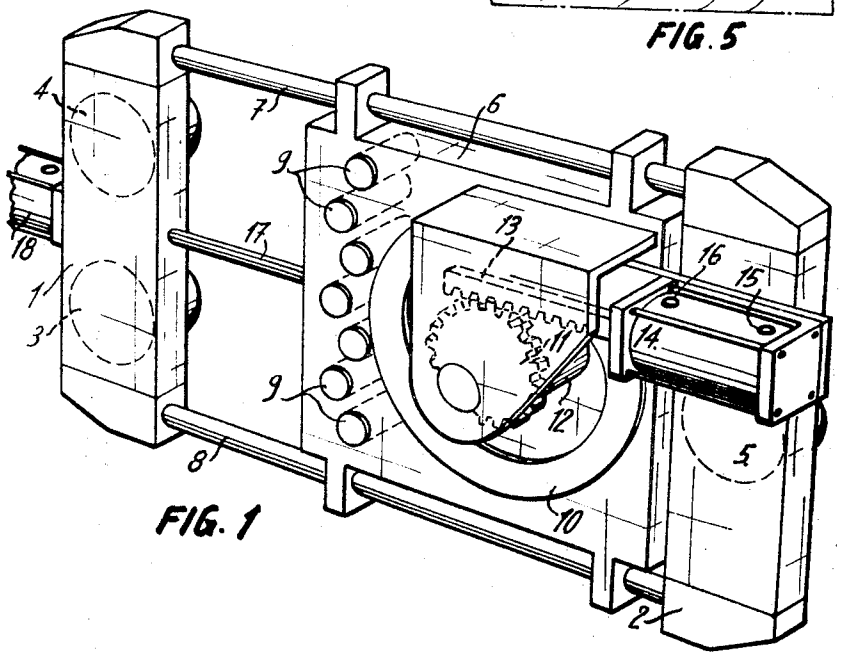

FIG. 1

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DEVICE FOR MOVING A WORKING APPARATUS ON A SUPPORT SURFACE

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ABSTRACT OF THE DISCLOSURE

An apparatus for moving a working apparatus over a supporting surface, particularly where the supporting surface is steeply inclined or even vertical. The apparatus includes first and second frames which are reciprocally movable relative to each other in response to a control means. Each of the frames includes a means for selectively securing the respective frame to a supporting surface. When one of the frames is secured to the supporting surface, movement of one of the frames relative to the other in response to the control means results in movement of such frame relative to the supporting surface as well. Thereafter, the just-moved frame may be secured to the supporting surface and the other one released therefrom so that further movement of a frame relative to the other frame now results in movement of the other frame relative to the supporting surface. As a consequence, the entire apparatus may be moved along the surface. A further means is provided for securing a portion of one of the frames to the supporting surface and then rotating the remainder of that frame together with the other frame, about the secured portion, thereby permitting an effective transverse motion of the entire apparatus over the supporting surface.

In many technical fields of activity it is often necessary to move an apparatus, for instance a rust scaling hammer apparatus, a welding device, a spray painting device, a television camera, an X-ray apparatus, etc. across a large surface. Such working operations are especially difficult and time consuming if the surface is vertical in which case as a rule scaffolds or movable platforms are necessary.

The object of the present invention is to provide a simple and effective device for automatic moving of such apparatus along adjustable paths of movement. According to the invention this is achieved by the fact that the apparatus is supported by two frame members reciprocatingly and linearily movable in relation to each other said frame members being provided with attaching members as eletcromagnets or suction cups capable to alternatingly adhere to the support surface in synchronism with the reciprocating movement of the frame members.

According to an embodiment of the invention the attaching member or members of one of the frame members is arranged, in its adhering state, to be turned an adjustable angle in rleation to said frame member in order to change the direction of movement of the device.

Another embodiment of the invention is characterized in that the two frame members are reciprocatingly and linearily movable in relation to each other in an additional direction perpendicular to the first mentioned linear direction of movement and in a plane parallel to the support surface in order to change the direction of movement of the device.

The invention will be more clearly explained in the following in connection to the accompanying drawing schematically showing an embodiment of the invention chosen as an example, in which

FIGURE 1 is a perspective of a rust scaling hammer apparatus,

FIGURES 2 to 4 illustrate the principle of the movement of the apparatus shown in FIG. 1, and

FIGURE 5 illustrates the apparatus in action on a ship's side plating.

The device shown on the drawing comprises a metallic frame having end sections **1** and **2** which are provided with electromagnets **3**, **4** and **5**. Two parallel rods **7** and **8** connect the end sections **1** and **2** and support a platform **6** slidingly mounted on the rods. The platform **6** is provided with a row of pneumatic hammers **9**, an electromagnet **10** and a toothed wheel **11**. The electromagnet **10** and the toothed wheel **11** are secured coaxially to a shaft **12** which is rotatably mounted on said platform **6**. A rack **13** meshes with the toothed wheel **11**. The rack is actuated by a piston running in a cylinder **14** attached to the platform **6** to which cylinder compressed air is supplied through apertures **15** or **16** in order to move the rack in one or the other direction and thus turn the magnet **10**. A rod **17** is actuated by a piston running in a cylinder **18** attached to the end section **1** and thus moves the platform **6** along the rods **7**, **8**.

The electromagnets **3**, **4**, **5** on one hand and on the other hand the electromagnet **10** are connected separately to an AC-current source.

The device operates in the following way: After the device has been placed on the ship's steel plating and its electromagnets and pneumatic cylinders has been connected to a control box operated by an operator **20**, it is possible to move the device optionally in all directions in the following manner:

A movement of the platform **6** is achieved when magnet **10** is deenergized and the piston in cylinder **18** is moved in the desired direction (FIG. 2). When the platform **6** reaches the end of its stroke abutting on one of the end sections **1** or **2** of the frame magnet **10** is first energized and then magnets **3**, **4** and **5** are deenergized and the piston in cylinder **18** is actuated to move in the opposed direction. The frame **1**, **2**, **7**, **8**, is thereby moved one step forward and after that the magnets **3**, **4**, **5** are energized and the magnet **10** is deenergized and so on. In this way it is possible to have the ship's side hammered from stem to stern along a path of movement having a width equal to the distance between upper and lower pneumatic hammers **9** on the platform **6**.

To change direction of movement the magnet **10** is energized, magnets **3**, **4**, **5** are deenergized and the piston in cylinder **14** is moved so that rack **13** forces the metal frame to turn e.g. as shown in FIG. 3. The frame reaches the position shown in FIG. 4 and then it is possible to move the device in the new direction as described above.

The invention is of course not limited to the embodiment shown but different modifications are possible within the scope of the invention. Thus the turning of magnet **10** in relation to platform **6** can be effected by other means than a rack. Moreover it is possible to use electric motors instead of pneumatic pistons and cylinders and suction cups connected to vacuum conduits instead of magnets **3**, **4**, **5** and **10** thus making it possible to use the device in connection with other kinds of support surfaces than ferromagnetic surfaces, e.g. for painting cisterns coated with aluminium plates. It is of course also possible to use the device on horizontal surfaces in which case the support surface can have a more uneven surface. Suitably the magnets or suction cups are resiliently mounted on the frame so that a reliable action is obtained even if the support surface is uneven.

What is claimed is:

1. Apparatus for moving a working apparatus over a supporting surface and comprising in combination, a first frame, a second frame movably engaging said first

frame, control means for reciprocally moving said first frame relative to said second frame, and securing means on each of said frames for selectively securing the respective frame to said supporting surface, whereby said second frame may be moved in response to said control means relative to said first frame and relative also to said supporting surface when said securing means secures only said first frame to said supporting surface, and alternatively said first frame may be moved in response to said control means relative to said second frame and relative also to said supporting surface when said securing means secures only said second frame to said supporting surface.

2. The apparatus of claim 1 in which said securing means for at least one of said frames comprises at least one electromagnet on said one frame adapted to engage said supporting surface.

3. The apparatus of claim 2 in which said electromagnet comprises a substantially planar portion adapted to make surface contact with said supporting surface.

4. The apparatus of claim 1 in which said control means includes a piston operatively connected to one frame and a cooperating cylinder operatively connected to the other frame.

5. The apparatus of claim 1 which further includes means on one frame rotatable with respect to said one frame and means for selectively securing said last-named means to said supporting surface.

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