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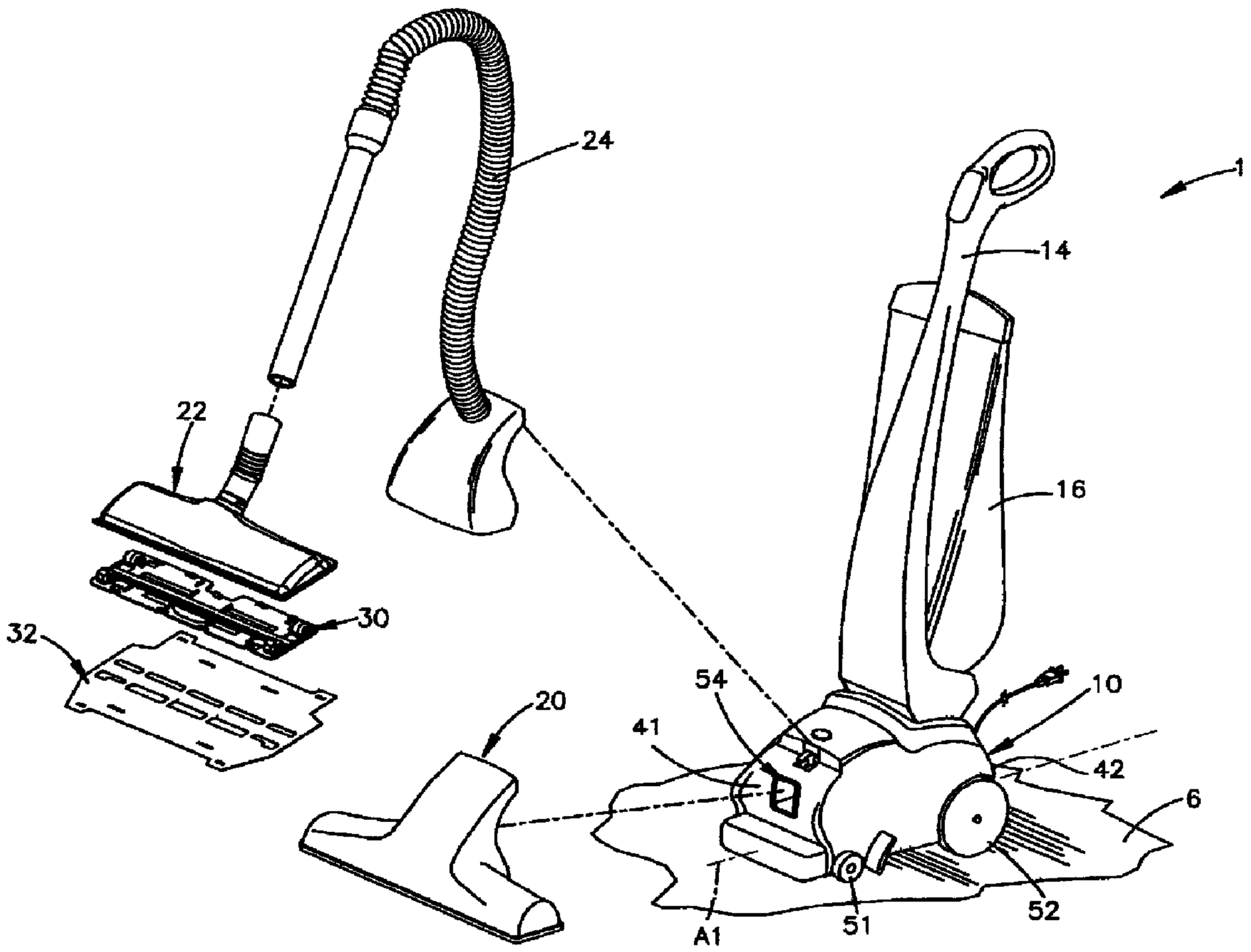
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(54) Titre : MANCHE D'ASPIRATEUR DOTE D'UNE FEUILLE JETABLE
(54) Title: VACUUM CLEANER NOZZLE WITH DISPOSABLE COVER SHEET




(57) Abrégé/Abstract:
A vacuum cleaner base includes a source of suction and front wheels and rear wheels for wheeling the base across a floor. A nozzle assembly is attached to and supported by the base. The nozzle assembly includes a suction inlet and a sheet-pressing

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(57) Abrégé(suite)/Abstract(continued):
surface that are located in front of the front wheels. A disposable sheet is configured to be removably attached to the nozzle assembly such that, as the base is wheeled across the floor, the sheet-pressing surface presses the sheet against the floor to dislodge dirt from the floor, and the suction draws the dirt from the floor through the suction inlet.

# ABSTRACT

A vacuum cleaner base includes a source of suction and front wheels and rear wheels for wheeling the base across a floor. A nozzle assembly is attached to and supported by the base. The nozzle assembly includes a suction inlet and a sheet-pressing surface that are located in front of the front wheels. A disposable sheet is configured to be removably attached to the nozzle assembly such that, as the base is wheeled across the floor, the sheet-pressing surface presses the sheet against the floor to dislodge dirt from the floor, and the suction draws the dirt from the floor through the suction inlet.

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# VACUUM CLEANER NOZZLE WITH DISPOSABLE COVER SHEET

## TECHNICAL FIELD

This technology relates to vacuum cleaners.

## BACKGROUND

A vacuum cleaner base can be wheeled across a floor. Different cleaning attachments can be removably attached to the base for cleaning different types of surfaces. These include a floor nozzle supported by the base and a vacuuming head that is coupled to the base by a hose. The base generates a flow of air that draws dirt through the nozzle or the cleaning head to clean a floor.

## SUMMARY

A vacuum cleaner base includes a source of suction and front wheels and rear wheels for wheeling the base across a floor. A nozzle assembly is attached to and supported by the base. The nozzle assembly includes a suction inlet and a sheet-pressing surface that are located in front of the front wheels. A disposable sheet can be removably attached to the nozzle assembly such that, as the base is wheeled across the floor, the sheet-pressing surface presses the sheet against the floor to dislodge dirt and the suction draws the dirt from the floor to and through the suction inlet.

The sheet includes an airflow opening configured for an airflow to carry dirt through the airflow opening to and through the suction inlet. The suction inlet is a front suction inlet of the nozzle assembly, and the nozzle assembly further includes a rear suction inlet, and the sheet-pressing surface is located between the front and rear suction inlets.

The sheet-pressing surface is a front sheet-pressing surface, and the nozzle assembly further includes a rear sheet-pressing surface, and the suction inlet is located between the front and rear sheet-pressing surfaces.

The nozzle assembly includes a nozzle and a bracket. The bracket is removably attached to the nozzle and includes the sheet-pressing surface. The nozzle includes a brushroll configured to rotate against the floor to dislodge dirt from the floor when the bracket and the sheet are removed from the nozzle. A portion of the sheet-pressing surface is located directly under the brushroll, and even directly under a rotational axis of the brushroll.

The nozzle assembly is removably attached to the base. The base includes a height adjust mechanism for raising and lowering the nozzle assembly. The sheet is impregnated with an oil. A nozzle assembly is configured to be connected to a source of suction. The nozzle assembly has front and rear suction inlets and a sheet-pressing surface located between the front and rear inlets. A disposable sheet has front and rear airflow openings. The sheet is configured to be removably attached to the nozzle assembly with the front and rear openings of the sheet respectively aligned with the front and rear inlet openings of the nozzle assembly. As the nozzle assembly is moved along a floor, the sheet-pressing surface presses the sheet against the floor to dislodge dirt from the floor, and the suction draws the dirt from the floor through the sheet's front and rear openings and the nozzle assembly's front and rear inlets.

Thus, in accordance with an aspect of the invention, there is provided a vacuum cleaning apparatus comprising: a vacuum cleaner base including a source of suction and front and rear wheels for wheeling the base across a floor; a nozzle assembly attached to and supported by the base, the nozzle assembly including a suction inlet and a sheet-pressing surface that are located in front of the front wheels; and a disposable sheet configured to be removably attached to the nozzle assembly such that, as the base is wheeled across the floor, the sheet-pressing surface presses the sheet against the floor to dislodge dirt from the floor, and the suction draws the dirt from the floor to and through the suction inlet.

There is also provided a vacuum cleaning apparatus comprising: a nozzle configured to be connected to a source of suction, the nozzle having a suction inlet and a brushroll extending through the suction inlet and configured to

rotate against a floor to dislodge dirt from the floor; a bracket removably attached to the nozzle and having a sheet-pressing surface, a portion of which located directly below the brushroll; and a disposable sheet having an opening and configured to be removably attached to the nozzle and configured such that, as the nozzle is moved along a floor, the sheet-pressing surface presses the sheet against the floor to dislodge dirt from the floor as the suction draws the dirt from the floor through the sheet's opening and the nozzle's suction inlet.

Another aspect of the invention provides a vacuum cleaning apparatus comprising: a nozzle assembly configured to be connected to a source of suction, the nozzle assembly having front and rear suction inlet openings and a sheet-pressing surface located between the inlet openings; and a disposable sheet having front and rear airflow openings, and configured to be removably attached to the nozzle assembly with the front and rear airflow openings of the sheet respectively aligned with the front and rear suction inlet openings of the nozzle assembly; and configured such that, as the nozzle assembly is moved along a floor, the sheet-pressing surface presses the sheet against the floor to dislodge dirt from the floor and the suction draws the dirt from the floor through the sheet's front and rear airflow openings and the nozzle assembly's front and rear inlet openings.

There is also provided a vacuum cleaning apparatus comprising: a nozzle assembly having opposite front and rear side edges and opposite first and second end edges, and configured to be connected to a source of suction, the nozzle assembly having front and rear sheet-pressing surfaces and an airflow inlet located between the sheet-pressing surfaces; and a disposable sheet having an airflow opening, configured to be removably attached to the nozzle assembly in a mounted position in which the airflow opening is located between the front and rear sheet-pressing surfaces and, under the first end edge, an end opening is vertically bounded by the nozzle assembly and the sheet and horizontally bounded by the front and rear sheet-pressing surfaces; configured such that, as the nozzle assembly is moved along a floor, the sheet-pressing surfaces press the sheet against the floor to dislodge dirt from the floor, and the suction draws air

through the end opening to the sheet's airflow opening for the air to carry the dirt from the floor upward through the sheet's airflow opening to and through the nozzle assembly's airflow inlet.

Yet another aspect of the invention provides a vacuum cleaner apparatus for use with a nozzle assembly having a scrubber configured to support the nozzle assembly in a cleaning position above a floor surface, the apparatus comprising: an elongated, generally rectangular sheet configured for mounting on the nozzle assembly in an installed position, the sheet having a longitudinal axis, a front portion with a longitudinally extending row of air flow inlets forward of the axis, a rear portion with a longitudinally extending row of air flow inlets rearward of the axis, and a central portion extending along the axis between the rows of air flow inlets, the central portion being configured for overlying engagement by the scrubber when the sheet is in the installed position.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of parts that can be interconnected in different combinations for different modes of vacuum cleaning, the parts including a base, a floor nozzle, a vacuuming head, a hose structure, a cover sheet, and a bracket.

FIG. 2 is a perspective view of the floor nozzle.

FIG. 3 is a perspective view of the floor nozzle attached to the base.

FIG. 4 is a perspective view of the vacuuming head.

FIG. 5 is a perspective view of the vacuuming head attached to the base.

FIG. 6 is one perspective view of the bracket, taken from beneath.

FIG. 7 is another perspective view of the bracket, taken from above.

FIG. 8 is a top view the cover sheet.

FIG. 9 is a perspective view the sheet being attached to the bracket.

FIG. 10 is a sectional view of the bracket being attached to the vacuuming head.

FIG. 11 is a sectional view of a vacuuming head assembly comprising the vacuuming head, the bracket and the sheet.

FIG. 12 is a perspective view of the vacuuming head assembly showing paths of air flowing into the assembly.

FIG. 13 is a sectional view of the base, the floor nozzle, the bracket and the sheet attached together.

FIG. 14 is a perspective view of the bracket and the sheet attached to another vacuuming head.

# DESCRIPTION

The apparatus shown in the drawings has parts that are examples of the elements recited in the claims. The illustrated apparatus thus includes examples of how a person of ordinary skill in the art can make and use the claimed invention. It is described here to meet the requirements of enablement and best mode without imposing limitations that are not recited in the claims.

## Overview

The apparatus 1 shown in Fig. 1 is a vacuum cleaner for cleaning a floor 6. It includes a base 10 configured to be wheeled across the floor 6, a handle 14 extending upward from the base 10, and a filter bag 16. A floor nozzle 20 can be attached to, and supported by, the base 10 for vacuum cleaning the floor 6. A cleaning attachment such as a vacuuming head 22 can be coupled by a hose assembly 24 to the base 10 for cleaning the floor 6 and above-the-floor surfaces. A bracket 30 can connect a disposable cover sheet 32 to the cleaning head 22 and to the floor nozzle 20.

## Base

The base 10 is located on an axis A1 and has axially-opposite front and rear ends 41 and 42. The base 10 has two front wheels 51 and two rear wheels 52 for wheeling the base 10 over the floor 6. It also has a suction inlet 54 in front of the front wheels 51.

## Floor Nozzle

As shown in Fig. 2, the floor nozzle 20 is located on an axis A2 and has axially opposite front and rear ends 101 and 102. The nozzle 20 further has a brushroll 110 with tufts 112 of bristles projecting through a suction inlet 120 at the bottom 122 of the nozzle 20. The inlet 120 is surrounded by front and rear flanges 131, 132 that extend respectively forward and rearward from an upwardly-extending surface 134 surrounding the nozzle 20.

Fig. 3 shows an upright vacuum cleaner 160 in which the floor nozzle 20 is attached to the front end 41 of the base 10. The nozzle 20 is supported by the base 10 and the base's wheels 51, 52, so as to move in unison with the base 10 as the base 10 is wheeled by its handle 14 across the floor 6. The brushroll 110 rotates against the floor 6 to dislodge dirt from the floor 6. The base 10 is configured to generate an air flow that draws dirt through the nozzle inlet 120 and the base's suction inlet 54 (Fig. 1) and deposits the dirt in the filter bag 16.

**Vacuuming Head**

The vacuuming head 22 is shown in Fig. 4. It is a type of vacuuming nozzle. It is an elongated, generally rectangular structure with a longitudinal axis A3, a transverse axis A4, and front and rear side edges 201 and 202. The head 22 has a planar bottom surface 222 configured to face the surface being cleaned. . Two front wheels 231 and two rear wheels 232 extend through holes in the bottom surface 222. The bottom surface 222 defines a longitudinally extending series of front suction inlets 241 and a longitudinally extending series of rear suction inlets 242. A longitudinally extending scrubber 244 is located between the front and rear air inlets 241 and 242. The scrubber 244 is a brush strip with bristles or fibers projecting downward from the bottom surface 222. Front and rear flanges 251 and 252 extend, with a slightly upward slant, respectively forward and rearward from the planar bottom surface 222. The head 22 has an outlet tube 256 that is pivotable (arrow 257) and rotatable (arrow 258) relative to the remainder of the head 22.

Fig. 5 shows a canister vacuum cleaner 260 in which the cleaning head 22 is attached to the base 10 by the hose assembly 24. One end of the hose assembly 24 is coupled to the suction inlet 54 (Fig. 1) of the base 10. The opposite end of the hose assembly 24 is coupled to the outlet tube 256 of the vacuuming head 22. In operation, the head 22 is moved forward and rearward across a surface to be cleaned, which is the floor 6 in this example. The base 10 is configured to be pulled across the floor 6 by the hose 24.

Referring to Figs. 4-5, the head's wheels 231 and 232 space the head's bottom surface 222 a set distance from the floor 6. The scrubber 244 dislodges dirt from the floor 6. The base 10 generates an air flow that draws the dirt through the vacuuming head's inlets 241, 242 and the hose 24 and deposits the dirt in the filter bag 16.

**Bracket**

As shown in Fig. 6, the bracket 30 also is an elongated, generally rectangular structure with a longitudinal axis A5 and a transverse axis A6. The bracket 30 further has front and rear side edges 301 and 302 and opposite end edges 324. A bottom surface 340 of the bracket 30 defines a longitudinally extending series of front air inlets 341 and a longitudinally extending series of rear air inlets 342.

A longitudinally extending front scrubber 351 is located between the front inlets 341 and the rear inlets 342. The front scrubber 351 preferably is a single elongated piece of elastic foam rubber, e.g., a sponge. A rear scrubber 352 is located rearward from the rear openings 342 and is parallel

with the front scrubber 351. The rear scrubber 352 is a brush strip with bristles or fibers projecting downward from the bracket's bottom surface 340. The brush strip 352 is bounded by a ridge extending downward from the bracket's bottom surface 340 to protect the bristles. The front and rear scrubbers 351 and 352 have respective bottom surfaces 361 and 362 configured to function as sheet-pressing surfaces by pressing the cover sheet 32 (Fig. 1) against the floor 6.

Two front spacers 371 extend downward from respective opposite front corners of the bracket 30. Two rear spacers 372 extend rearward from respective opposite rear corners of the bracket 30. As shown in Fig. 7, the bracket 30 has front and rear outer hooks 381, 382 and front and rear inner hooks 391, 392 that project upward.

**Cover Sheet**

The cover sheet 32 is shown in Fig. 8. It might be cut from of a mat of air-permeable non-woven melt-blown polypropylene fibers that is impregnated with mineral oil. Like the head 22 and the bracket 30, the sheet 32 is elongated and generally rectangular with longitudinal and transverse axes A7 and A8. The sheet 32 has eight attachment holes 420 for hooking the sheet 32 onto the hooks 381, 382, 391, 392 (Fig. 7) of the bracket 30. The sheet 32 has a longitudinally-extending row of front airflow openings 441 shaped similar to, and configured to be aligned with, the bracket's front openings 341. The sheet 32 further has a longitudinally-extending row of rear openings 442 that are shaped similar to, and configured to be aligned with, the bracket's rear openings 342.

The sheet 32 has a front portion 451 located in front of the front openings 441, a middle portion 452 located between the front and rear openings 441, 442, and a rear portion 453 located rearward from the rear openings 442. The middle portion 452 is configured to bear the pressure applied by the bracket's front sheet-pressing surface 361. The rear portion 453 is configured to bear the pressure applied by the bracket's rear sheet-pressing surface 362.

**Using the Cover Sheet with the Cleaning Head**

To attach the sheet 32 to the bracket 30, first the bracket 30 is placed downward onto the sheet 32 as shown in Fig. 9. Then, the sheet's front and rear portions 451, 453 are wrapped respectively about the front and rear side edges 301 and 302 of the bracket 30. As indicated by arched arrows, the attachment holes 420 in the front and rear portions 451 and 453 of the sheet 32 are slipped over the corresponding hooks 381, 382, 391, 392 of the bracket 30, to secure the sheet 32

to the bracket 30. The sheet 32 is thus attached to the bracket 30 as shown in Fig. 10. The sheet 32 is not wrapped about the bracket's opposite end edges 324.

To attach the bracket 30 to the cleaning head 22, the bracket 30 is pressed up against the head's bottom surface 222 as indicated by arrow 470 in Fig. 10. The bracket's outer hooks 381, 382 hook onto the head's front and rear flanges 351, 352. The bracket's inner hooks 391, 392 extend through respective attachment holes 280 in the head's bottom surface 222.

The head 22, the bracket 30 and the sheet 32 are thus attached together to form a cleaning head assembly 500 shown in Fig. 11. The front and rear scrubbers 351, 352 keep the bracket's bottom surface 340 and its front and rear inlets 341, 342 spaced above the floor 6. As the assembly 500 is moved forward (arrow 501) and backward, the front and rear sheet-pressing surfaces 361 and 362 press the sheet 32 against the floor 6 to scrub or scrape dirt from the floor 6. Due to resiliency of the scrubbers 351 and 352, when the middle and rear portions 452 and 453 of the sheet 32 ride over a dirt particle that raises one point on the sheet 32 above the floor 6, adjacent points on the sheet 32 can remain under load.

The front airflow openings 241, 341, 441 of the three components 22, 30, 32 of the assembly 500 are mutually aligned. This enables a front airflow 511 to carry dirt from the floor 6 through the front openings 241, 341, 441 into the vacuuming head 22. Similarly, the rear openings 242, 342, 442 are mutually aligned, to enable a rear airflow 512 to carry dirt through the rear openings 242, 342, 442 into the vacuuming head 22.

By manipulating the head's outlet tube 256, the head 22 can be pivoted rearward about the rear scrubber 352 to lift the front scrubber 351 from the floor 6 and increase the airflow into the front openings 241, 341, 441. The head 22 can also be pivoted forward about the front scrubber 351 to lift the rear scrubber 352 above the floor 6 and increase the airflow through the rear openings 242, 342, 442. When the head 22 is pivoted, the front and rear spacers 371, 372 keep the front and rear ends 321, 322 of the bracket 30 spaced above the floor 6.

Air that provides the upward airflows 511 and 512 can enter the assembly 500 through several paths. As shown in Fig. 12, these include a rearward path 520 at the front of the assembly 500 and a pair of end paths 521 and 522 at each end of the assembly 500. The rearward path 520 extends under the bracket's front side edge 301. The end paths 521 and 522 extend under the bracket's opposite end edges 324 and through front and rear openings 531 and 532 beneath the opposite end edges 324. The openings 531 and 532 are vertically bounded by the sheet 32 and the bottom surface 340 of the bracket 30. The rear opening 532 is horizontally bounded by the front and rear scrubbers 351 and 352. These paths 521 and 522 are made possible by the bracket's bottom

surface 340 being raised above the floor 6 by the scrubbers 351 and 352 and by the sheet 32 not being wrapped about the ends 324 of the bracket 30.

The mineral oil impregnated in the sheet 32 increases the sheet's adhesion to dust and reduces the sheet's friction with the floor 6. However, friction with the front sheet-pressing surface 361 is increased by its having a high-friction rubbery texture. The sheet 32 protects the floor 6 from being marred by hard surfaces of the cleaning head 22. It also prevents the floor 6 from abrading the scrubbers 351, 352. Dirt picked up by the sheet 32 is disposed of when the used sheet 32 is discarded and replaced with a new one.

**Using the Cover Sheet with the Floor Nozzle**

To attach the sheet 32 to the floor nozzle 20, first the sheet 32 is attached to the bracket 30 as explained above with reference to Fig. 9. Then, referring to Figs. 2 and 10, the bracket 30 is pressed upward against the nozzle's bottom 120. The bracket's inner hooks 391, 392 extend through the nozzle inlet 120 to hook onto upward-facing surfaces inside the nozzle 20.

This yields a nozzle assembly 600 shown in Fig. 13, comprising three components – the nozzle 20, the bracket 30, and the sheet 32. These three components, including their respective air inlet openings 120, 341, 342, 441, 442 are all located in front of the front wheels 51. This configuration, relative to if these components were not in front of the front wheels 51, facilitates mounting of the nozzle 20 on the base 10, and mounting the other components 32, 30 on the nozzle 20, by positioning the nozzle 20 out in front of the base 10 and its wheels 51, 52. This configuration also enables locating the air inlet openings 120, 341, 342, 441, 442 closer to a household wall.

The bracket 30 lifts the brushroll 110 away from the ground 6, with the front scrubber 351 located between the brushroll 110 and the ground 6. The front scrubber's sheet-pressing surface 361, along with the sheet 32, takes the place of the brushroll 110 in dislodging dirt from the floor 6. Accordingly, at least a portion of the front sheet-pressing surface 361 is located directly under the brushroll 110, and preferably even directly under the rotational axis A9 of the brushroll 110. Preferably, the sheet pressing surface 361 is axially centered under the brushroll's rotational axis A9.

In operation, a user wheels the base 10 forward and backward by the handle 14. Concurrently, the bracket's front and rear sheet-pressing surfaces 361, 362 press the sheet 32 against the floor 6 for the sheet 32 to scrape dirt from the floor 6. In contrast to use of the sheet 32 with the cleaning head 22, in which the bracket 30 can be pivoted forward or backward by the user, use of the sheet 32 with the nozzle 20 does not enable such pivoting. The angular orientation of the bracket 30 and its height from the floor 6 are kept constant by the base 10. The bracket 30 can be raised or

lowered, to vary the pressure of the scrubbers 351, 352 against the floor 6, only by raising or lowering the entire nozzle 20 via a height adjust mechanism 610 on the base 10.

The bracket 30 and sheet 32 protect the floor 6 from being marred by hard surfaces of the nozzle 20. The sheet 32 prevents the floor 6 from abrading the scrubbers 351, 352. The sheet 32 also picks up dirt, which is disposed of when the used sheet 32 and is replaced with a new one.

**Using the Cover Sheet with another Cleaning Head**

Fig. 14 shows the bracket 30 and the sheet 32 attached to a second cleaning head 22'. This head 20' is similar to the first cleaning head 22 described above. The second cleaning head 22' is connected to the bracket 30 in the same way as the first cleaning 22 is attached to the bracket 30. Also, an assembly comprising the second head 22', the bracket 30 and the sheet 32 has the same cross section as the assembly 500 (Fig. 11) comprising the first head 22, the bracket 30 and the sheet 32. The second head 22' differs from the first head 22 in that it is shorter in the transverse direction. Consequently, two portions 700 of the bracket 30 extend transversely outward from the second head 22' in two opposite directions. These portions 700 contain the bracket's inner hooks 391, 392. So the bracket 30 is secured to the second head 22' by only its outer hooks 381, 382.

This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to make and use the invention. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have elements that do not differ from the literal language of the claims, or if they include equivalent elements with insubstantial differences from the literal language of the claims.

## CLAIMS

1. A vacuum cleaning apparatus comprising:

a vacuum cleaner base including a source of suction and front and rear wheels for wheeling the base across a floor;

a nozzle assembly attached to and supported by the base, the nozzle assembly including a suction inlet and a sheet-pressing surface that are located in front of the front wheels; and

a disposable sheet configured to be removably attached to the nozzle assembly such that, as the base is wheeled across the floor, the sheet-pressing surface presses the sheet against the floor to dislodge dirt from the floor, and the suction draws the dirt from the floor to and through the suction inlet.

2. The apparatus of claim 1 wherein the sheet includes an airflow opening, configured for an airflow to carry dirt through the airflow opening to and through the suction inlet.

3. The apparatus of claim 1 wherein the suction inlet is a front suction inlet of the nozzle assembly, and the nozzle assembly further includes a rear suction inlet, and the sheet-pressing surface is located between the front and rear suction inlets.

4. The apparatus of claim 3 wherein the nozzle assembly further includes a second sheet-pressing surface, located rearward from the rear suction inlet, that presses the sheet against the floor as the base is wheeled across the floor.

5. The apparatus of claim 1 wherein the sheet-pressing surface is a front sheet-pressing surface, and the nozzle assembly further includes a rear sheet-pressing surface, and the suction inlet is located between the front and rear sheet-pressing surfaces.

6. The apparatus of claim 1 wherein the nozzle assembly includes a nozzle and a bracket, with the bracket removably attached to the nozzle and including the sheet-pressing surface.

7. The apparatus of claim 1 wherein the nozzle assembly includes a brushroll configured to rotate against the floor to dislodge dirt from the floor when the sheet is removed from the nozzle assembly.

8. The apparatus of claim 7 wherein a portion of the sheet-pressing surface is located directly under the brushroll.

9. The apparatus of claim 1 wherein the nozzle assembly is removably attached to the base.

10. The apparatus of claim 1 wherein the base includes a mechanism for raising and lowering the nozzle assembly.

11. The apparatus of claim 1 wherein the sheet is impregnated with an oil.

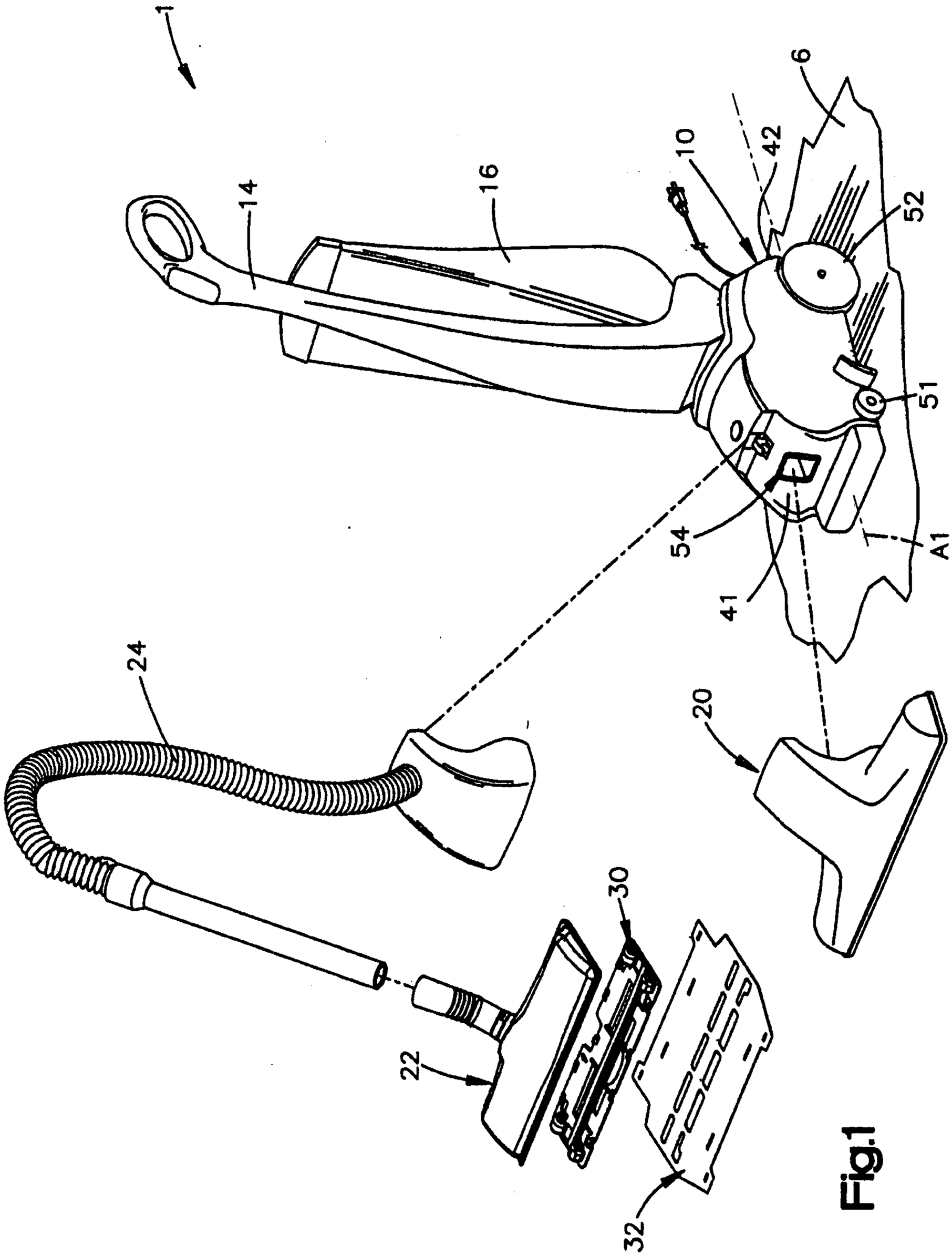



Fig.1

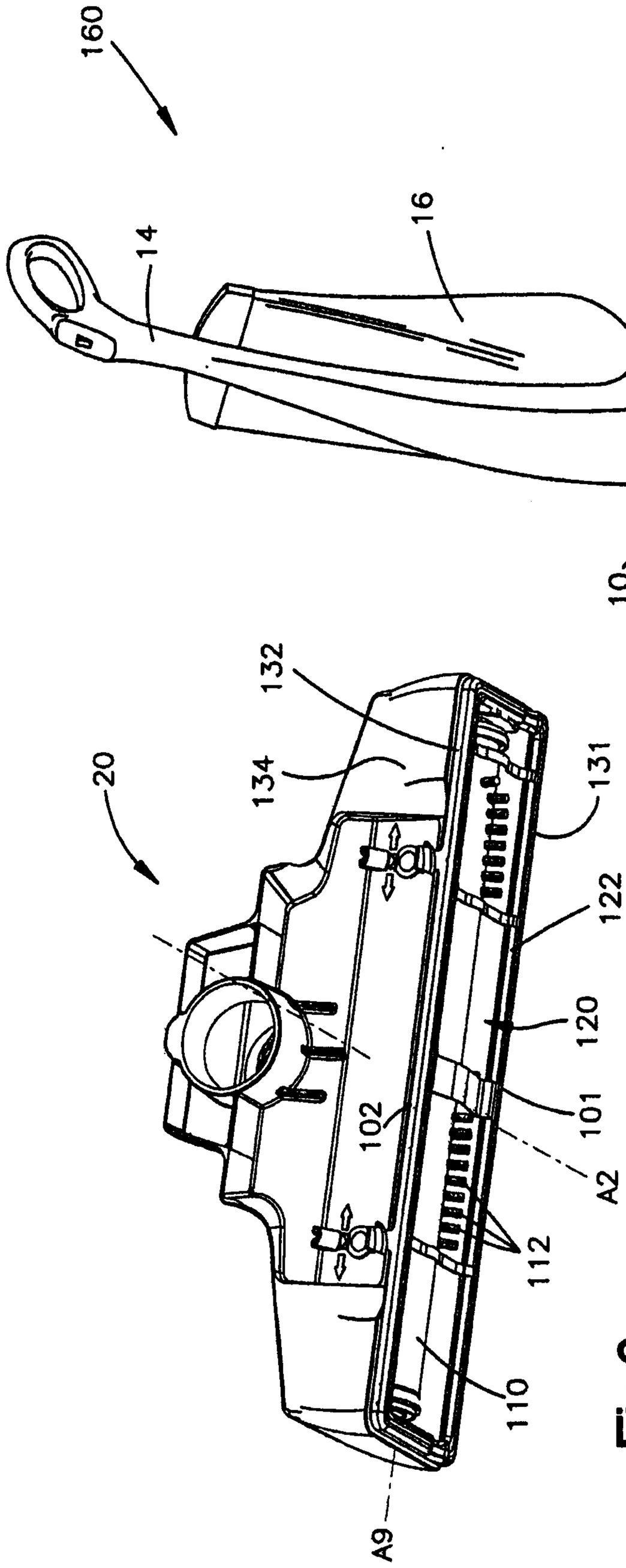

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A2
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Fig.2


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Fig.3

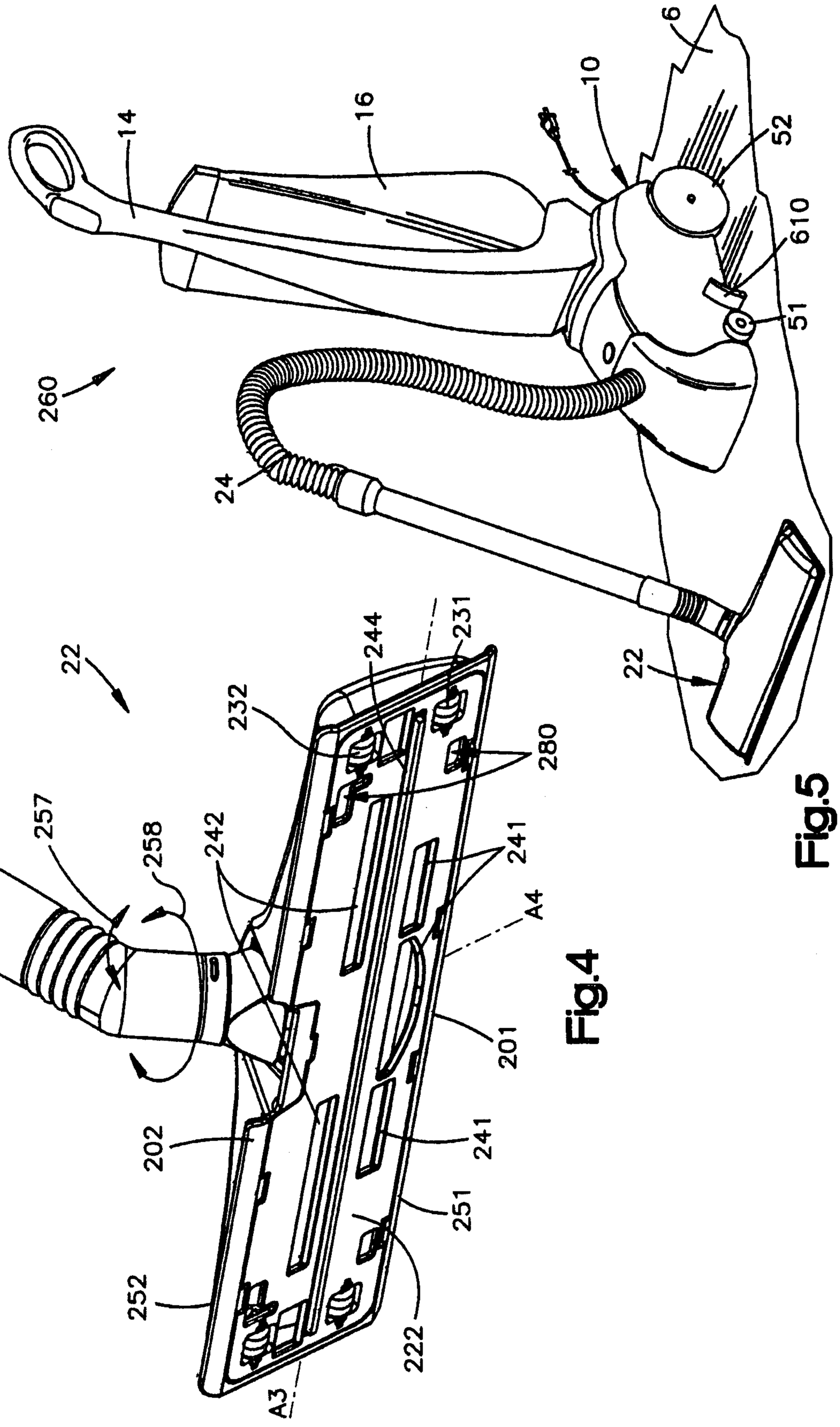

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A3
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610
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14
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Fig.4

Fig.5

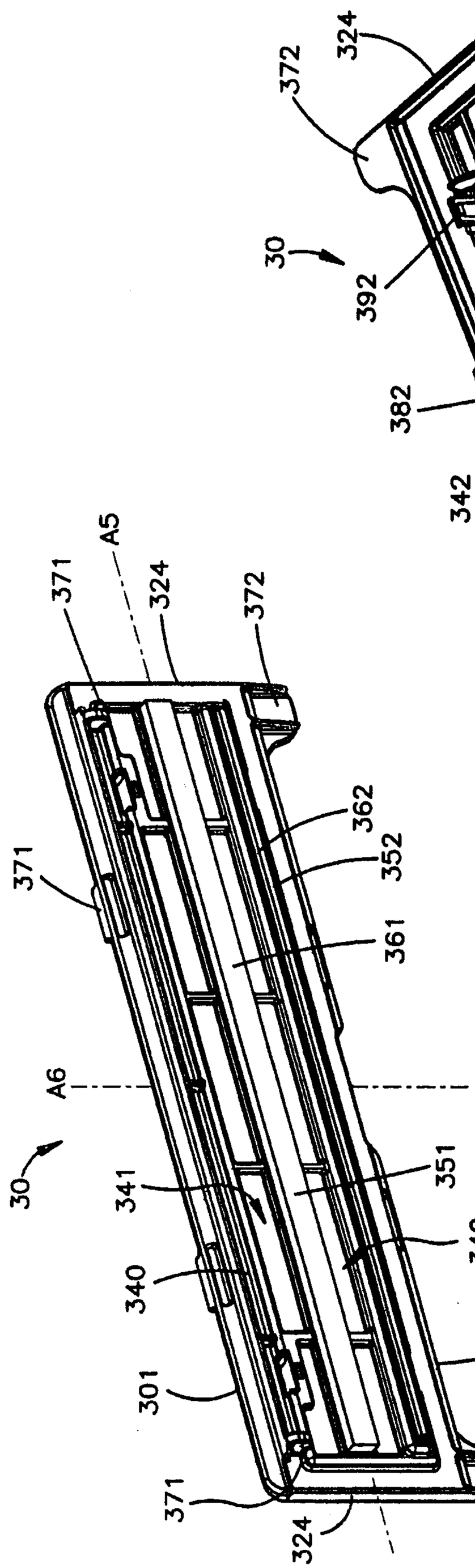

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A6
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Fig.6

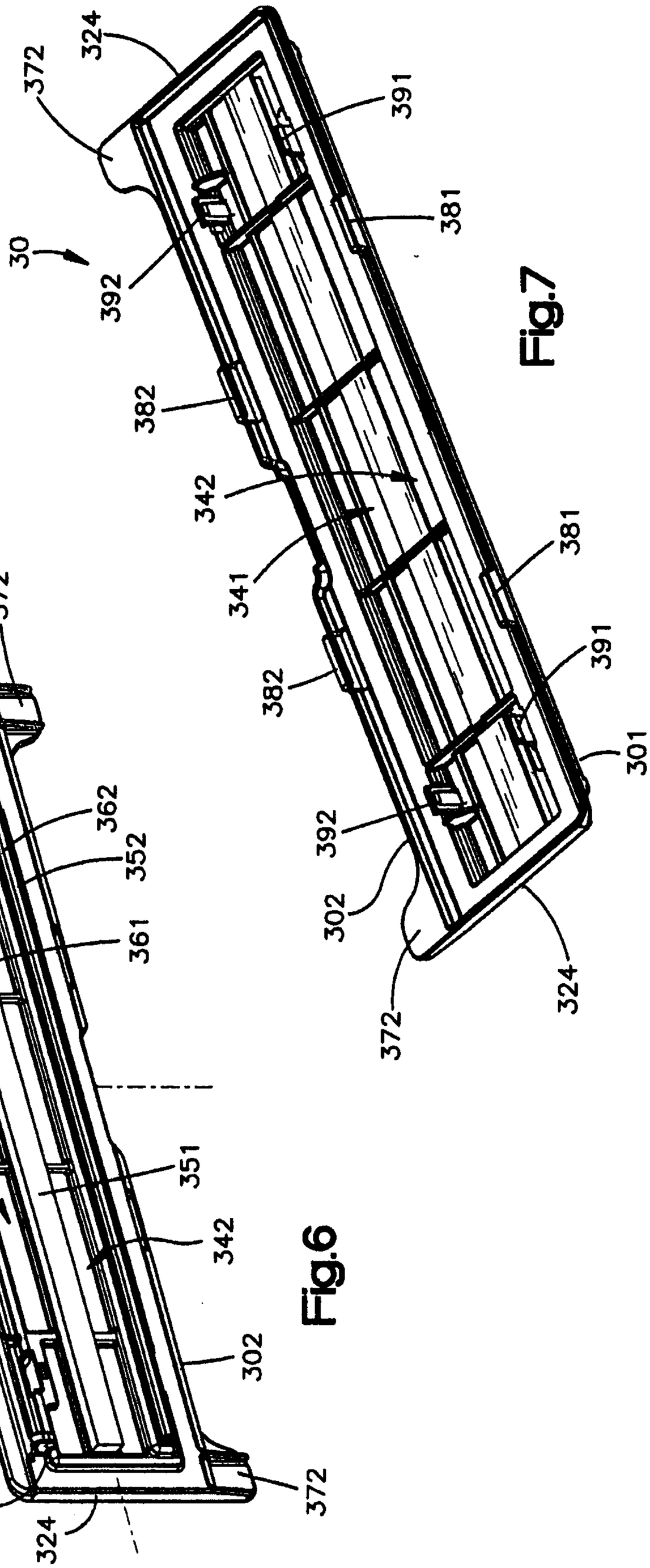

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Fig.7

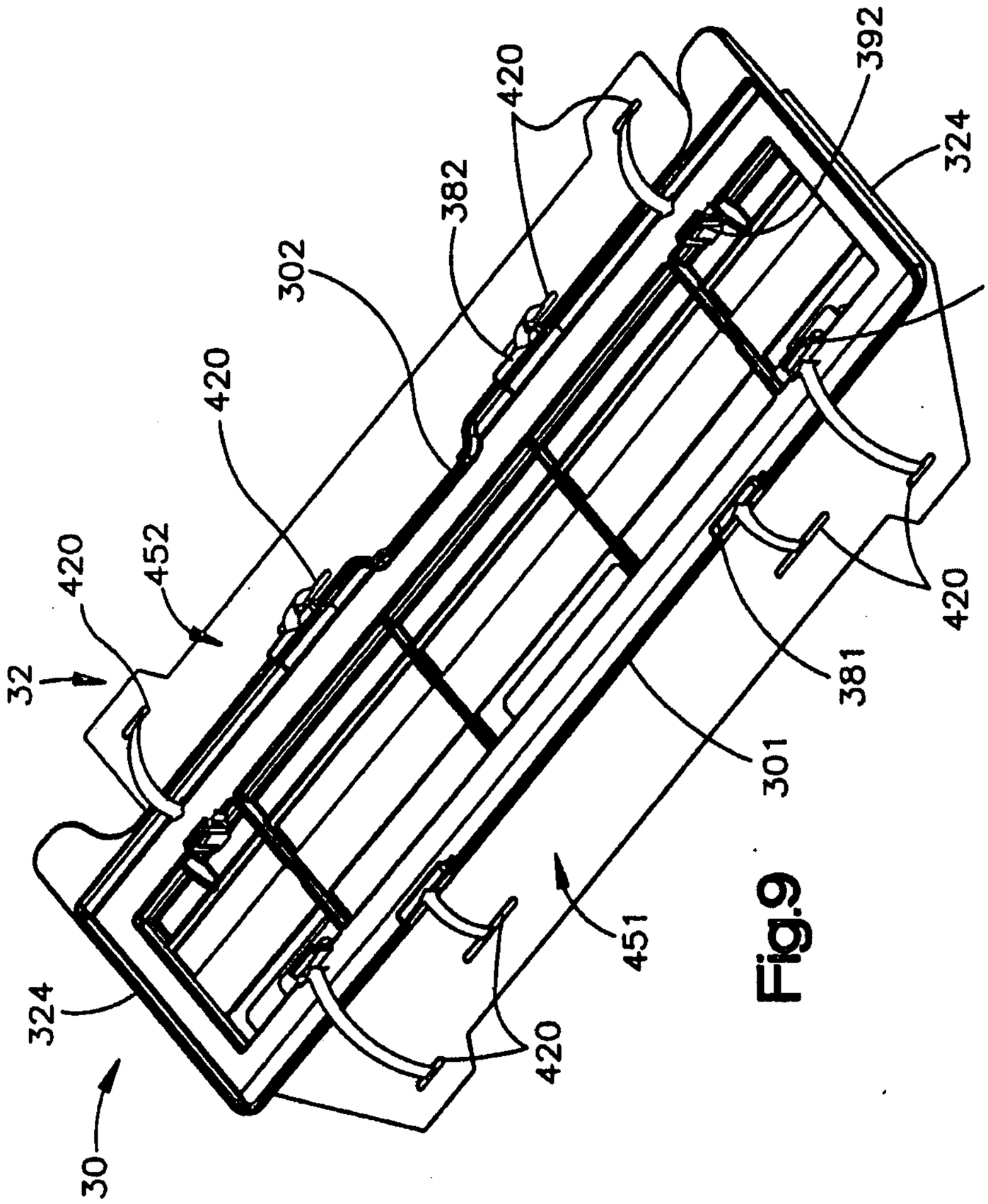

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Fig.9

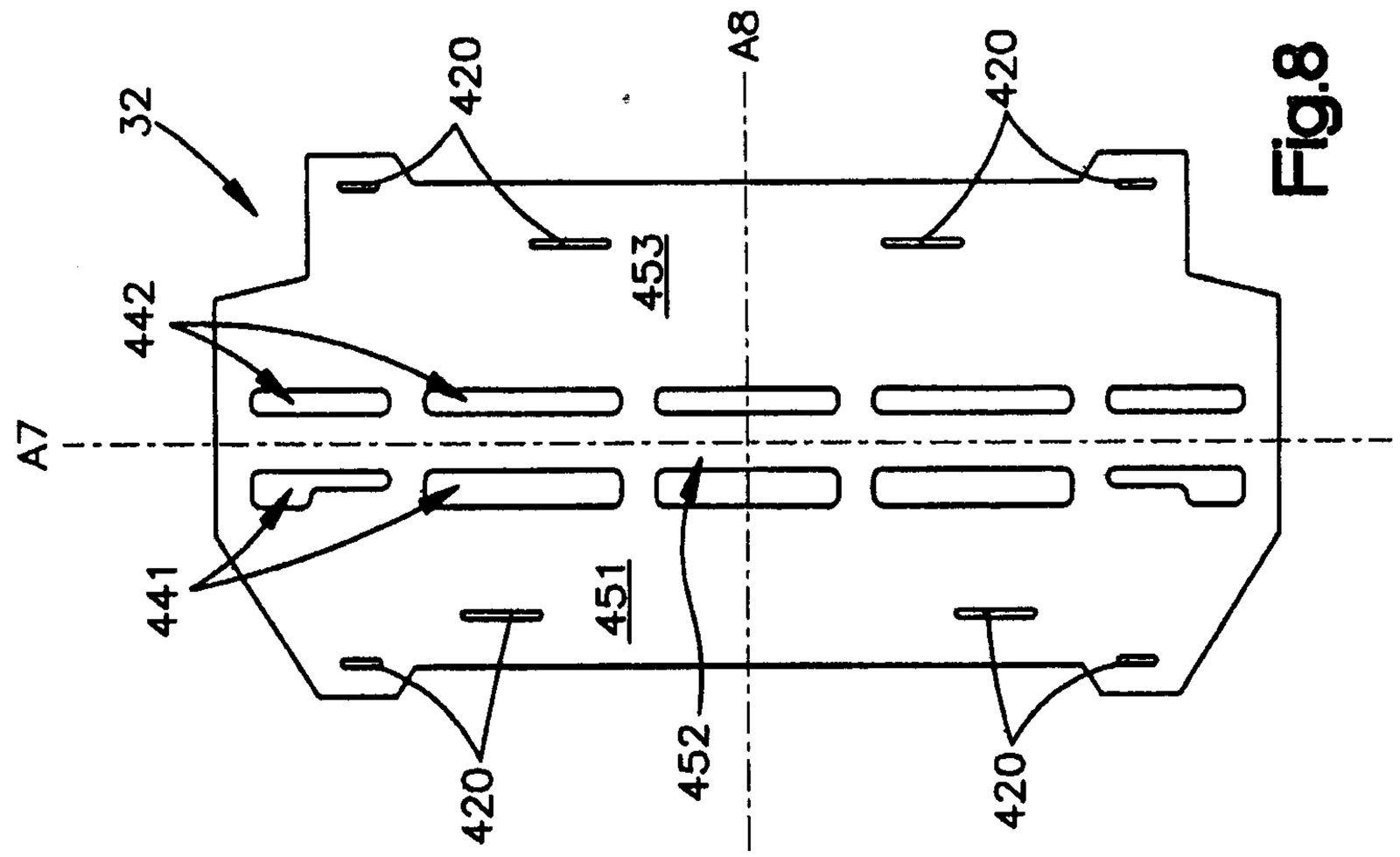
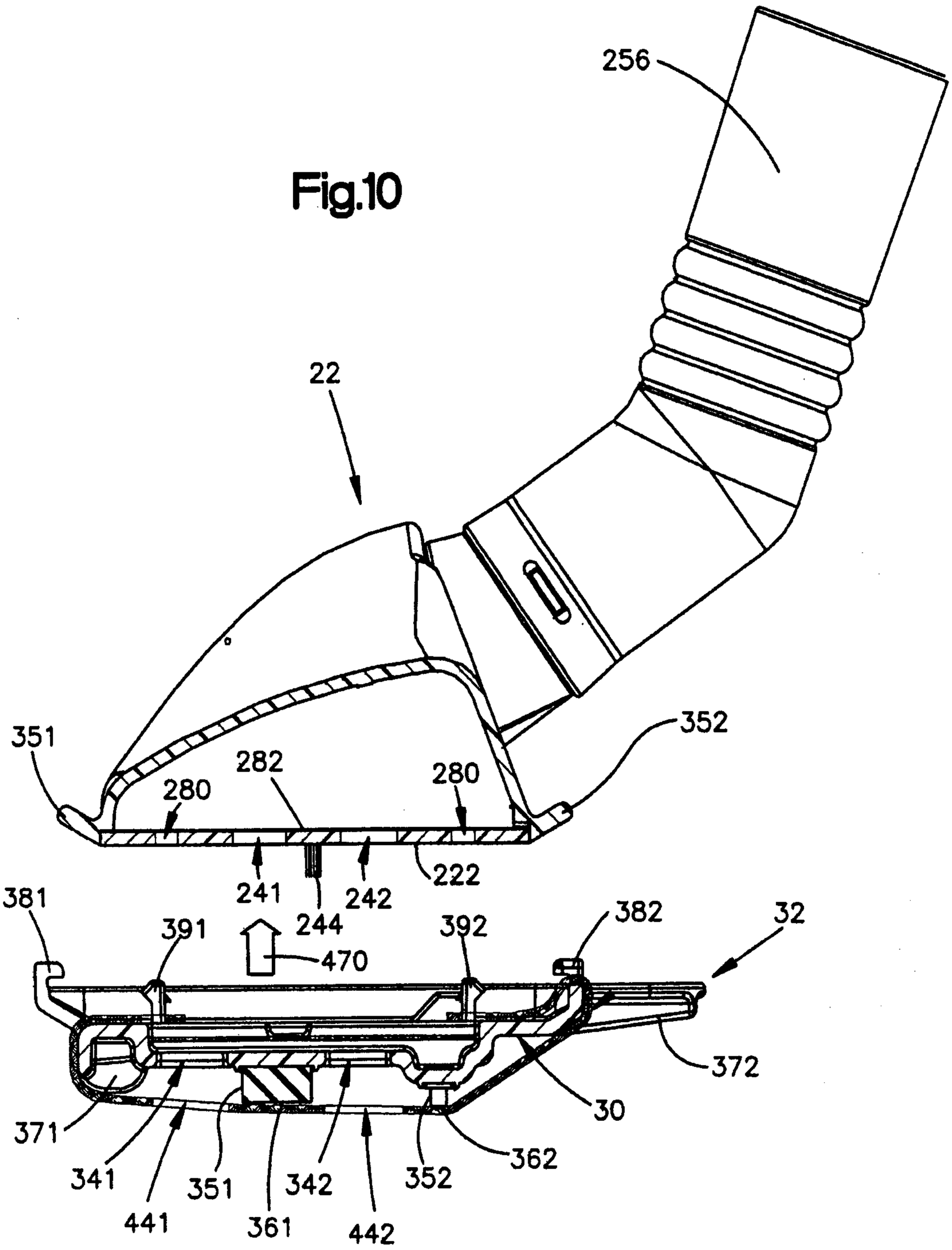

32
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A8
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453
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A7
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Fig.8

Fig.10


256
22
351
280
282
280
352
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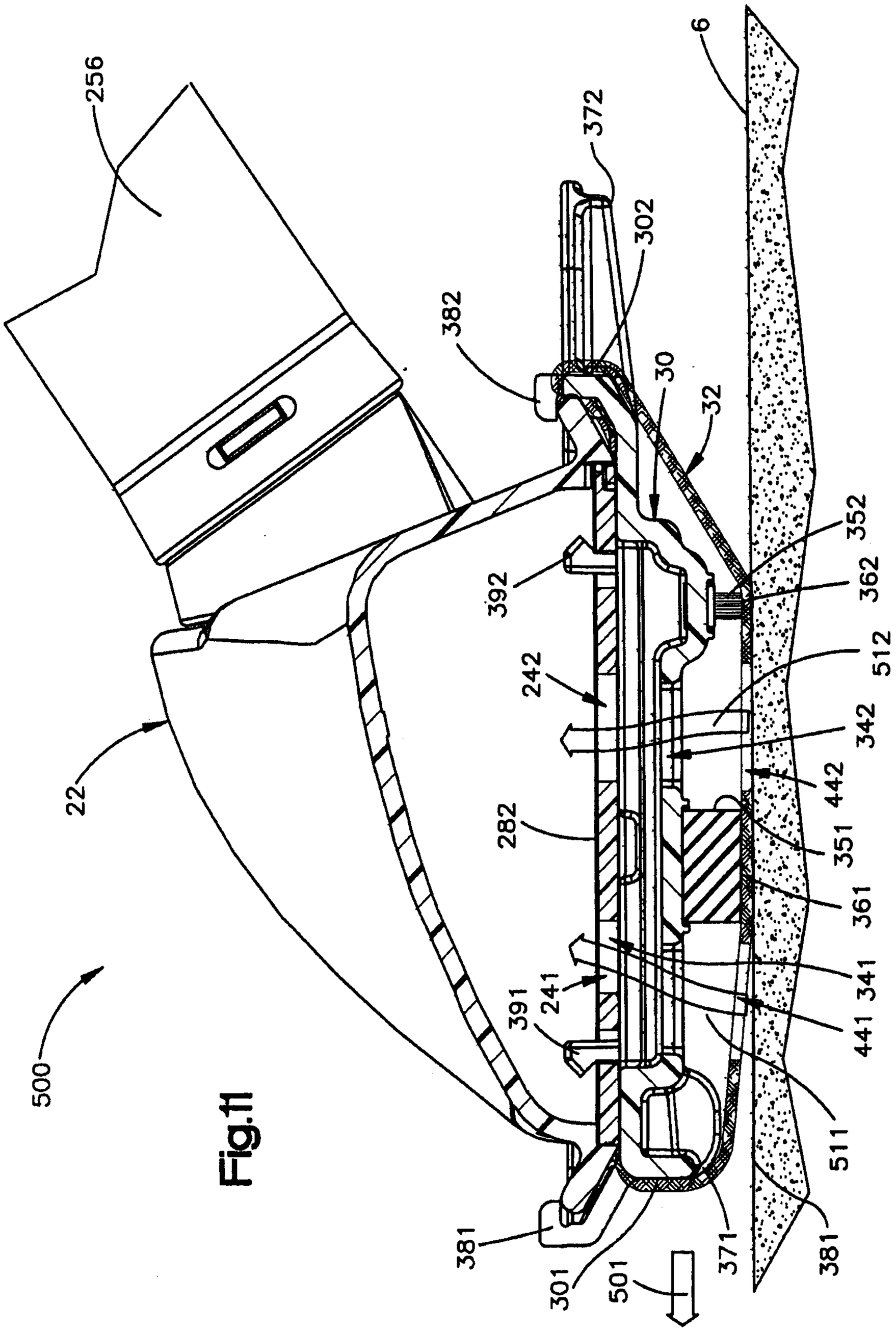

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351
361
391
241
341
441
511
22
500
381
301
501
371
381

Fig.11

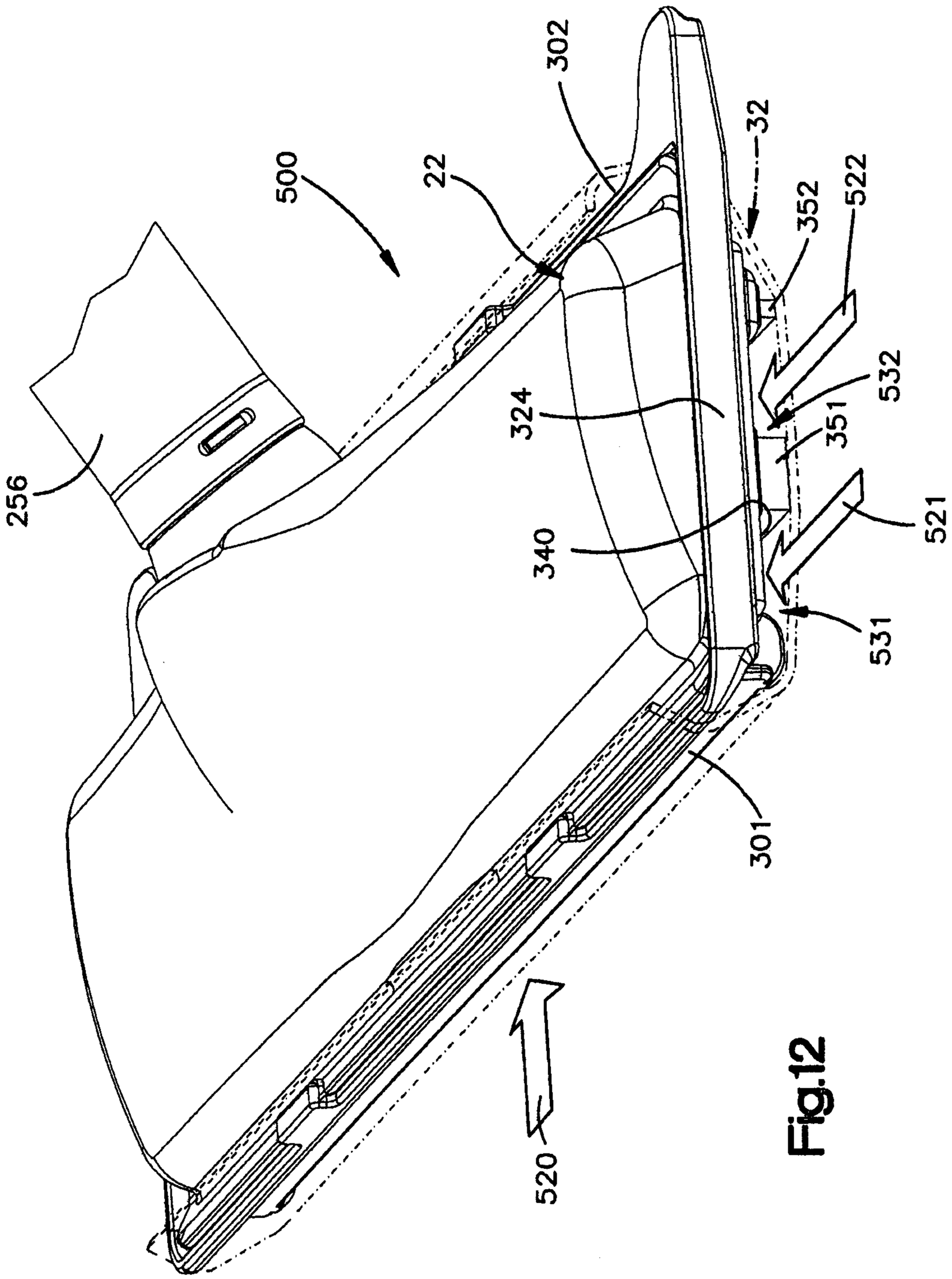



Fig.12

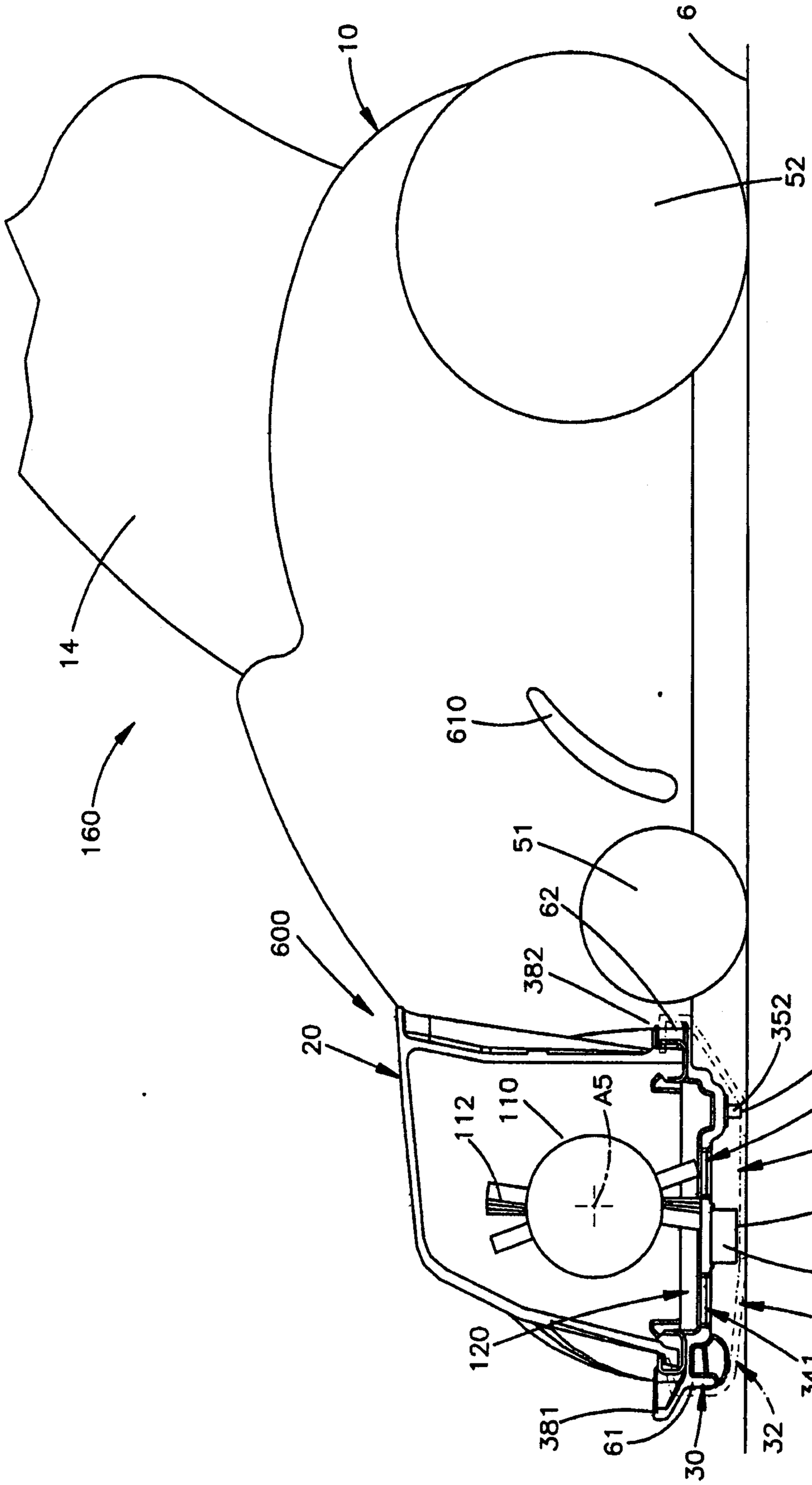

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6
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14
160
610
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62
382
600
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352
362
342
442
112
110
A5
361
351
441
120
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381
61
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Fig.13

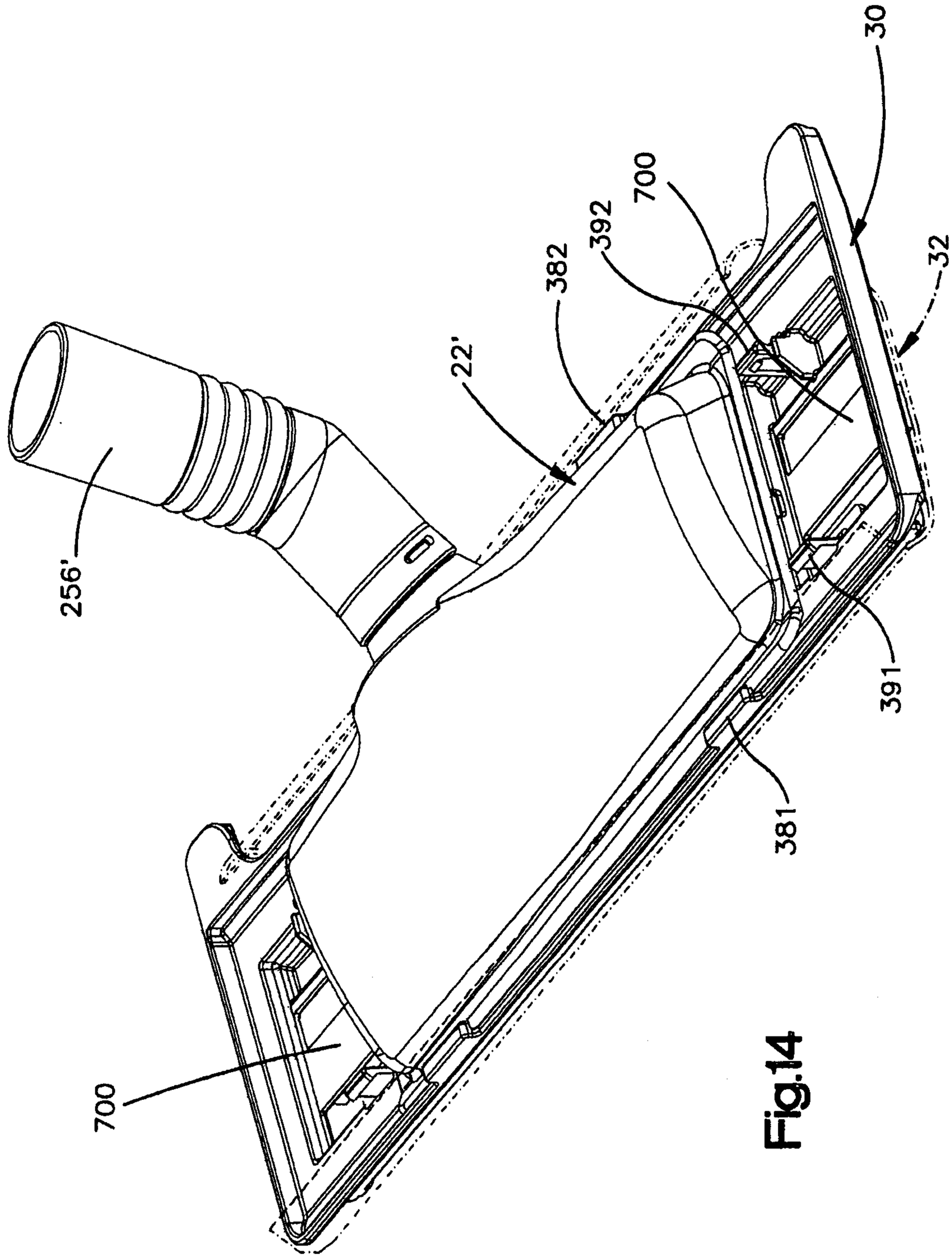
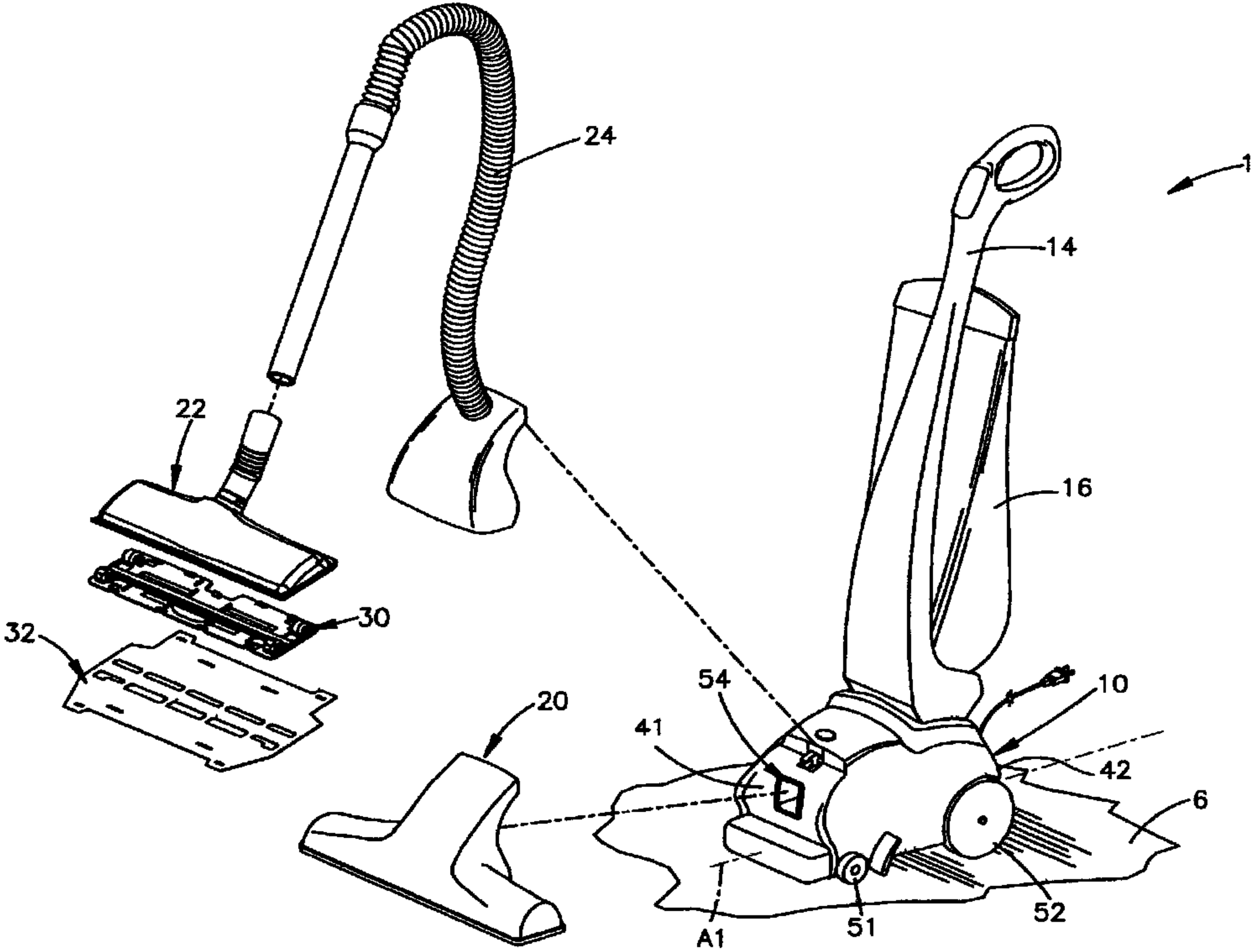



Fig.14


24
22
30
32
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16
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41
42
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A1
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