(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 104 497**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **83108638.4**

(51) Int. Cl.³: **D 06 F 39/12**

(22) Date of filing: **01.09.83**

(30) Priority: **28.09.82 IT 4573282**

(43) Date of publication of application:
04.04.84 Bulletin 84/14

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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(54) Laundry washing machine of modular construction.

(57) In a laundry washing machine according to the invention, the housing thereof is formed by an assembly of two housing elements (5, 6) and a support frame (7).

Each housing element (5, 6) comprises a main wall portion forming the front surface (8) and the rear surface (22), respectively, of the housing, and a pair of lateral wall portions (9, 10 and 23, 24) extending parallel to one another at right angles to the main wall portion. The support frame (7) on its part forms a support structure for the washing assembly and all of the functional components of the machine, and comprises at least one elongate profile member bent to a shape formed by two vertical legs (35, 36) and a horizontal member (37). A pair of cross members (38, 39) affixed to the lower portions of the vertical legs (35, 36) are provided with adjustable leveling feet (42) for engagement with the floor. The two housing elements (5, 6) are brought into mutual contact with their lateral wall portions and attached to the vertical legs (35, 36) of the support frame (7). There is thus obtained a modular construction of the washing machine, which is readily assembled and easily accessible.

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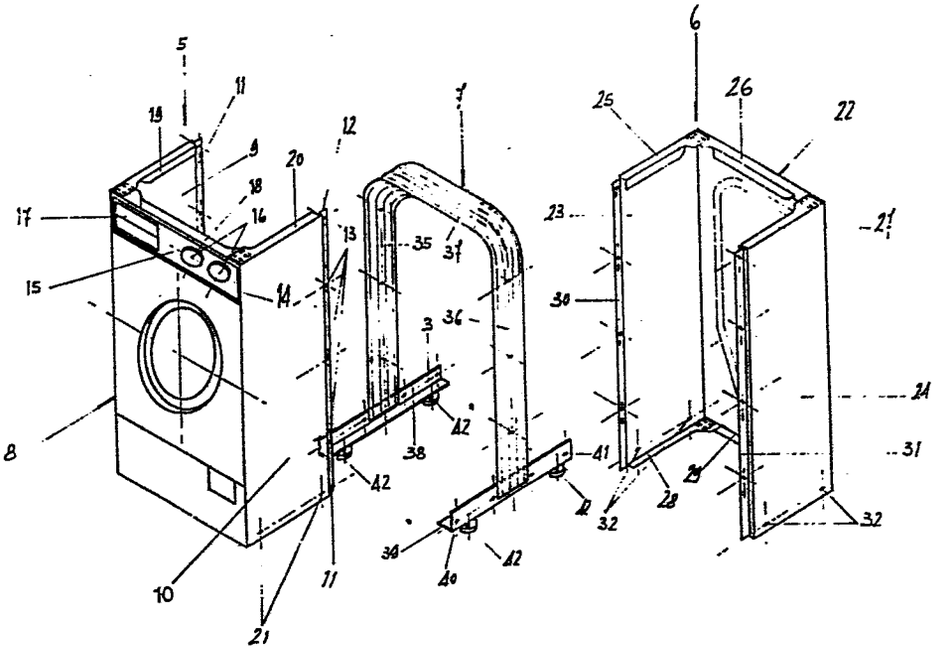
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Fig 1

Description

The present invention relates to a laundry washing machine, particularly of the front-charging type, of a modular construction comprising a housing composed of two separate and mutually engageable housing elements and a support frame adapted to support all of the functional components of the machine and to have said housing elements externally affixed thereto.

Conventional laundry washing machines comprise a housing formed of paint-coated or enamelled metal sheet which is bent to form three sides of the housing, namely, a front side and the two lateral sides, the rear side of the housing remaining initially open to be closed by means of an additional rear panel.

The thus formed housing structure is provided with upper and lower welded strengthening cross members, resulting in a rigid, self-supporting structure adapted to support the washing assembly and the various functional components of the machine. The top portion of the housing is covered with a conventional work surface affixed to the housing in a per se known manner.

Although laundry washing machines having a housing of the above noted construction operate in a satisfactory manner, they still suffer from certain shortcomings.

In the first place, the various mecanical and electrical components of the machine are installed in a restricted space within the housing, so that access to them is rather difficult even after dismounting of the waork surface and the rear panel, whereby repair and maintenance operations and the replacement of damaged components is greatly complicated. On the other hand, as the housing performs the function of the supporting structure for all of the functional components of the machine, and has to this effect to

be reinforced in the described manner so as to be able to sustain the mechanical loads exerted thereon during operation of the machine, the manufacture of the housing involves an increased consumption of materials and a great number of manufacturing steps.

The presence of welded connections in the housing of a conventional washing machine moreover forbids the application of the most recent metal sheet surface treatment technologies, such as for instance a powder spray-coating process, which would otherwise be mor convenient from the technical and economical points of view, and does not either permit the employ of pre-coated or enamelled metal sheets which would not require any subsequent surface treatment.

It is an object of the present invention to overcome the described inconveniences by providing a housing for a laundry washing machine which is of a simple modular construction completely different from that of known washing machine housings.

The housing under discussion is substantially composed of a support frame of reduced dimensions adapted to support all of the functional components of the machine, and of two separate housing elements adapted to be brought into mutual contact in a surrounding relationship to the support frame and the components of the machine and to be releasably connected to the support frame.

According to the invention, the frame is provided with support elements rigidla affixed thereto as by welding or by other conventional connection means, while the housing elements exclusively serve as the outer casing of the washing machine which may thus be designed to any suitable or desirable configuration. The housing elements may thus be designed as a one-piece construction and finished in a single operation, as they do not require any reinforcement as employed in conventional constructions. The housing elements may thus be formed of traditional metallic

materials of reduced wall thickness, resulting in a reduced consumption of material with the attendant economical advantages.

In addition, these metallic materials may be subjected to more sophisticated and advantageous surface treatments, such as for instance a powder spray-coating treatment, or may even be employed in a surface-finished, for instance pre-painted state, so as to eliminate any further surface treatment of the material itself.

As the housing elements are not required to have any particular mechanical strength, they may also be made of non-metallic materials such as plastics or the like.

These and other objects of the invention are attained by a laundry washing machine, particularly of the front-charging type, provided with an external housing adapted to enclose and support a washing assembly comprising a tub and a drum rotatably mounted within said tub, as well as all of the electrical and mechanical components of the machine.

According to the invention, a laundry washing machine of this type is characterized in that said housing is composed of at least a first and a second housing element adapted to be connected to one another and each formed as a one-piece construction, and at least one rigid support frame adapted to support said washing assembly and said components of the machine, said housing elements being adapted to be releasably assembled with one another with said support frame interposed therebetween, and to be covered on top by a plane work surface.

The characteristics and advantages of the invention will become evident from the following description, given by way of a non-limiting example with reference to the accompanying drawings, wherein:

fig. 1 shows an exploded perspective view of the various components of a housing of a laundry washing machine in a first embodiment of the invention,

fig. 2 shows a frontal view of a support frame forming part of the housing shown in fig. 1, with the washing assembly of the washing machine suspended therein,

fig. 3 shows a cross-sectional view of the support frame taken along the line A-A in fig. 2, and

fig. 4 shows an exploded perspective view of the various components of a housing of a laundry washing machine in a second embodiment of the invention.

With reference to fig. 1 there is shown a housing of a laundry washing machine, particularly of the front-charging type, said housing being composed of two separate housing elements 5 and 6 and a rigid support frame 7, the construction of which will be described in detail hereinafter.

Each housing element 5, 6 is formed as a substantially box-shaped casing by suitably punching and bending a single piece of metal sheet.

In particular, housing element 5 is formed to have a main wall portion 8 forming the plane front surface of the finished housing, and two plane lateral wall portions 9 and 10 extending parallel to one another at right angles to the main wall portion 8 so as to form a portion each of the two lateral surfaces of the finished housing.

Each lateral wall portion terminates in a rectilinear vertical edge 11 and 12, respectively, provided with a series of bores 13. Housing element 5 is further formed with an upper through-opening 14 for insertion and securing therein a panel 15 carrying a number of knobs 16 for selecting the various washing programmes of the machine and the electrical components associated with the knobs 16. Opening 14 may also contain additional components of the machine,

such as for instance a detergent container 17.

For stiffening housing element 5, the upper and lower edge portions of main wall portion 8 and lateral wall portions 9 and 10 are bent inwards so as to form an upper ledge 18, 19, 20 and a lower ledge (not shown), said ledges having their overlapping end portions secured to one another as by welding or by means of conventional fastener elements.

Formed adjacent the lower edges of the lateral wall portions 9 and 10 of housing element 5 are further openings 21 for securing the housing element to support frame 7 in a manner to be described.

Mass-produced housing elements of the above described type, although all of the same construction, may be designed with varying exterior appearance so as to distinguish between various models of washing machines.

The housing element 6 is substantially of the same construction as the housing element 5 described above, including a plane main wall portion 22 forming the rear surface of the finished housing, and two lateral wall portions 23 and 24 each forming a part of the respective side surface of the finished housing.

Housing element 6 is further formed with inwards bent upper edge portions 25, 26, 27 and lower edge portions, only two of which are visible and designated 28 and 29, and vertically extending rectilinear edge portions 30, 31 provided with holes for connecting the two housing elements 5 and 6 to one another.

The lateral wall portions 23 and 23 of housing element 6 have their lower portions likewise formed with further openings 32 for connection to support frame 7.

Examining now figs. 1 and 3, it is noted that the support

frame 7 of the housing is substantially composed of two elongate profiled metal members 33 and 34 connected to one another in side-by-side relationship in a conventional manner and bent in their longitudinal direction to the shape of an inverted letter "U" having two vertical legs 35 and 36 connected to one another by a horizontal top portion 37 and dimensioned so as to fit between the two housing elements 5 and 6.

In the example shown, the two profile members 33 and 34 together form a twin box-shaped section, with the contours particularly of the outer profile member 34 being suitably formed for overlapping engagement with the respective edge portions 11, 12 and 30, 31 of the two housing elements 5 and 6, said profile member being in addition provided with bores corresponding to those formed in the said edge portions.

The vertical legs 35 and 36 have their lower end portions centrally fixed in a conventional manner to a pair of metallic cross members 38 and 39, respectively, formed each with a series of holes 40 and 41, respectively, corresponding to the holes 21 and 32 formed in the respective lateral wall portions 9, 10 and 23, 24. Cross members 38 and 39 are further provided with adjustable levelling feet 42 of rubber or the like supporting the frame on the floor.

The thus composed support frame is of rigid and compact construction so as to efficiently support the washing assembly as well as all of the remaining electrical and mechanical components of the washing machine.

The support frame may of course also be formed of profile members and cross members of different configuration and with other contours than described above, without leaving the scope of the invention.

As shown in fig. 2, the washing assembly composed of a tub 43 and a drum 44 rotatably mounted within tub 43 is suspended in frame 7 by means of suspension springs 45 and 46 anchored to the upper portion of frame 7, and shock dampeners 47, 48 supported by suitable brackets 49, 50 fixedly attached to the lower portion of frame 7.

With the exception of a main drive motor 51 suspended from tub 43, the remaining electrical and mechanical components of the washing machine, which, as already stated, are also supported by support frame 7, are not shown in the drawing.

After the washing assembly and the remaining electrical and mechanical components of the washing machine have been mounted in support frame 7, the assembly of the washing machine is completed by connecting the two housing elements 5 and 6 to support frame 7.

According to the invention, this is done by merely aligning housing elements 5 and 6 with one another and with support frame 7 in the forward and rearward position with respect thereto, and releasably connecting the three structural components by means of self-cutting screws or the like (not shown) threaded into the corresponding holes of the lateral wall portions 9, 10 and 23, 24, of the vertical edge portions 11, 12 and 30, 31 and the vertical legs 35 and 36 of support frame 7.

The upper end of the thus formed housing is finally covered by a conventional work surface (not shown) which is fixed in position in a per se known manner.

Shown in fig. 4 are the structural members of a housing for a laundry washing machine in a modified embodiment of the invention, in which the two housing elements designated 52 and 53 are of a different shape than those of the above described embodiment, while support frame 7 is identical

to the one previously described. In the embodiment shown, the fron housing element 52 is formed in one piece with the upper work surface 54, the depth of which corresponds to that of the washing machine itself.

The rear housing element 53, on the other hand, is of a somewhat smaller height than the rear housing element of the previously described embodiment, so as to properly adapt itself to the modified forward housing element 52 and to permit the housing elements to be suitably connected to one another and to support frame 7 in the manner described above.

The modified housing elements 52 and 53 may advantageously be formed of a plastics material by a die-forming or thermo-forming process.

The advantages obtained by the laundry washing machine of modular construction according to the invention are clearly evident from the above description.

In the first place, the described machine is of a much simpler construction than known washing machines. Thanks to the fact, that it is composed of pre-assembled modular elements, it can be produced in a more rational manner employing novel production technologies, for instance by the employ of separate assembly lines.

As the modular elements are interchangeable among another, it is also possible to produce laundry washing machines having identical functional components, but with a variable outer appearance, by employing the same rear housing element and the same support frame in combination with forward housing elements of any desired appearance.

A further advantage of this type of a laundry washing machine consists in that the functioan components thereof are readily accessible after dismounting the housing elements

from the support frame, so that repair and maintenance work as well as the replacement of any of the components are greatly facilitated.

As in the described laundry washing machine the support frame is the only structural member to perform a carrying function, lateral vibrations of the machine are practically eliminated. As a result, the housing elements may be formed of a material offering less resistance to mechanical loads, for instance plastics materials, and/or with a reduced wall thickness and without the employ of interior stiffening members as in the past.

This leads to considerable savings of material and to a reduction of the required number of working steps in manufacture.

As the housing elements are finally constructed in one piece and without any welded joints, it is possible to adopt more advanced surface treatment technologies, for instance the powder spray-coating method, or to employ pre-coated metal sheet material which does not require any subsequent surface treatment, resulting in technically and economically advantageous production methods.

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Laundry Washing Machine of Modular Construction

Patent Claims

1. A laundry washing machine, particularly of the front-charging type, provided with an external housing adapted to enclose and support a washing assembly comprising a tub and a drum rotatably mounted within said tub, as well as all of the electrical and mechanical components of the machine, characterized in that said housing is composed of at least a first and a second housing element (5, 6) adapted to be connected to one another and each formed as a one-piece construction, and at least one rigid support frame (7) adapted to support said washing assembly and said components of the machine, said housing elements (5, 6) being adapted to be releasably assembled with one another with said support frame (7) interposed therebetween, and to be covered on top by a plane work surface.

2. A laundry washing machine according to claim 1, characterized in that said first and second housing elements (5, 6) are each formed with a main wall portion (8, 22) forming the front or rear surface of the assembled housing, respectively, and with two lateral wall portions (9, 10; 23, 24) extending parallel to each other and at right angles to the respective main wall portion (8, 22) said lateral wall portions of the two housing elements (5, 6) being adapted to be brought into mutual contact for forming the respective side surfaces of the assembled housing and to be connected to said frame (7) by means of per se known fastening elements introduced into corresponding bores of said lateral wall portions and said frame.

3. A laundry washing machine according to claim 1 or 2, characterized in that said support frame (7) comprises at least one elongate profiled member bent to the shape of an inverted letter "U" having two vertical legs (35, 36) and a horizontal top portion (37) and dimensioned to fit between said first and second housing elements (5, 6), said vertical legs (35, 36) having their lower ends fixedly attached to respective cross members (38, 39) provided with adjustable levelling feet (42) or the like for engagement with the floor.

4. A laundry washing machine according to any of claims 1 to 3, characterized in that said first housing element (52) is formed in one piece with said upper work surface (54).

5. A laundry washing machine according to any of the preceding claims, substantially as described with reference to the accompanying drawings and for the stated purposes.

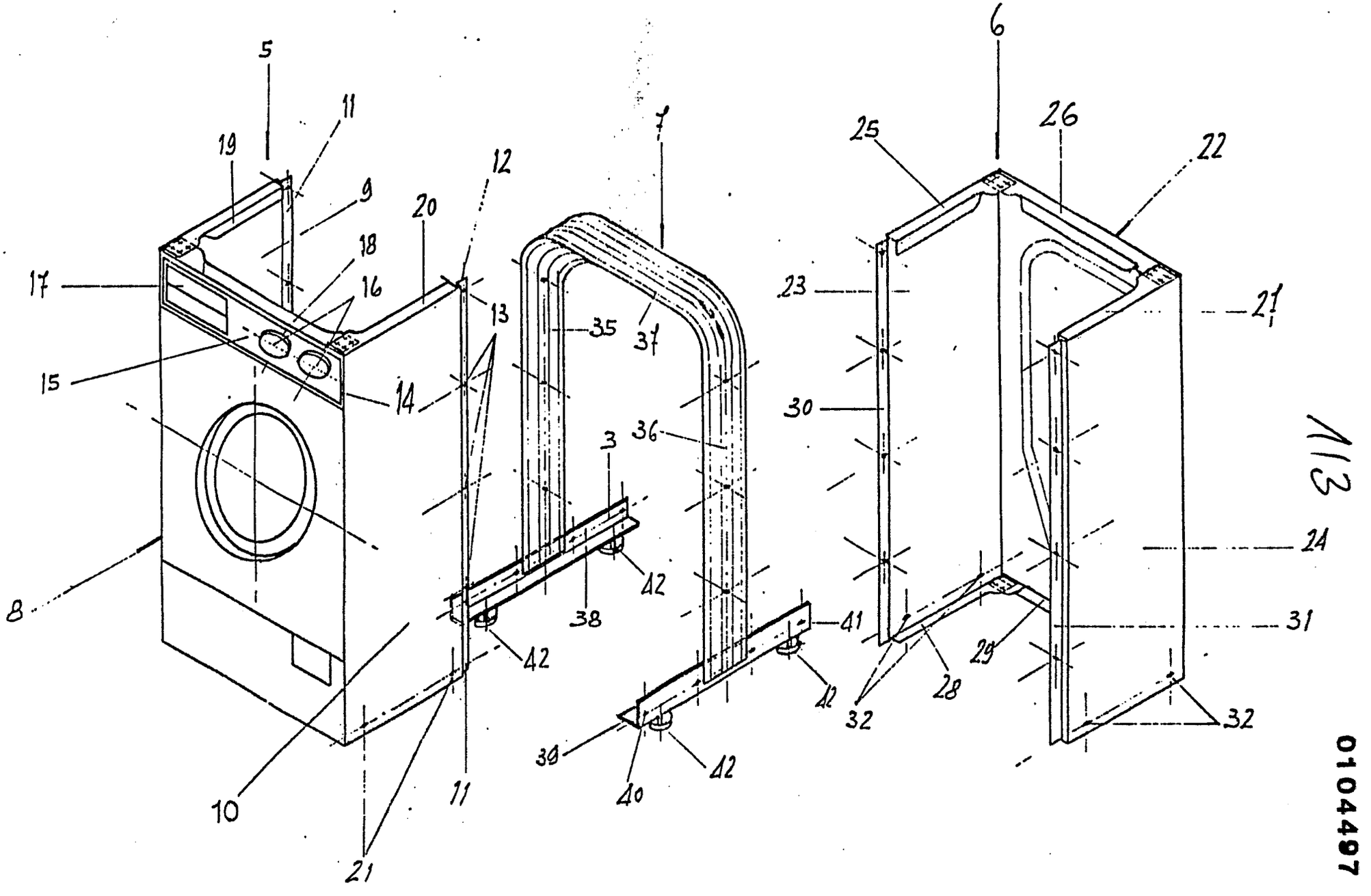

Fig. 1

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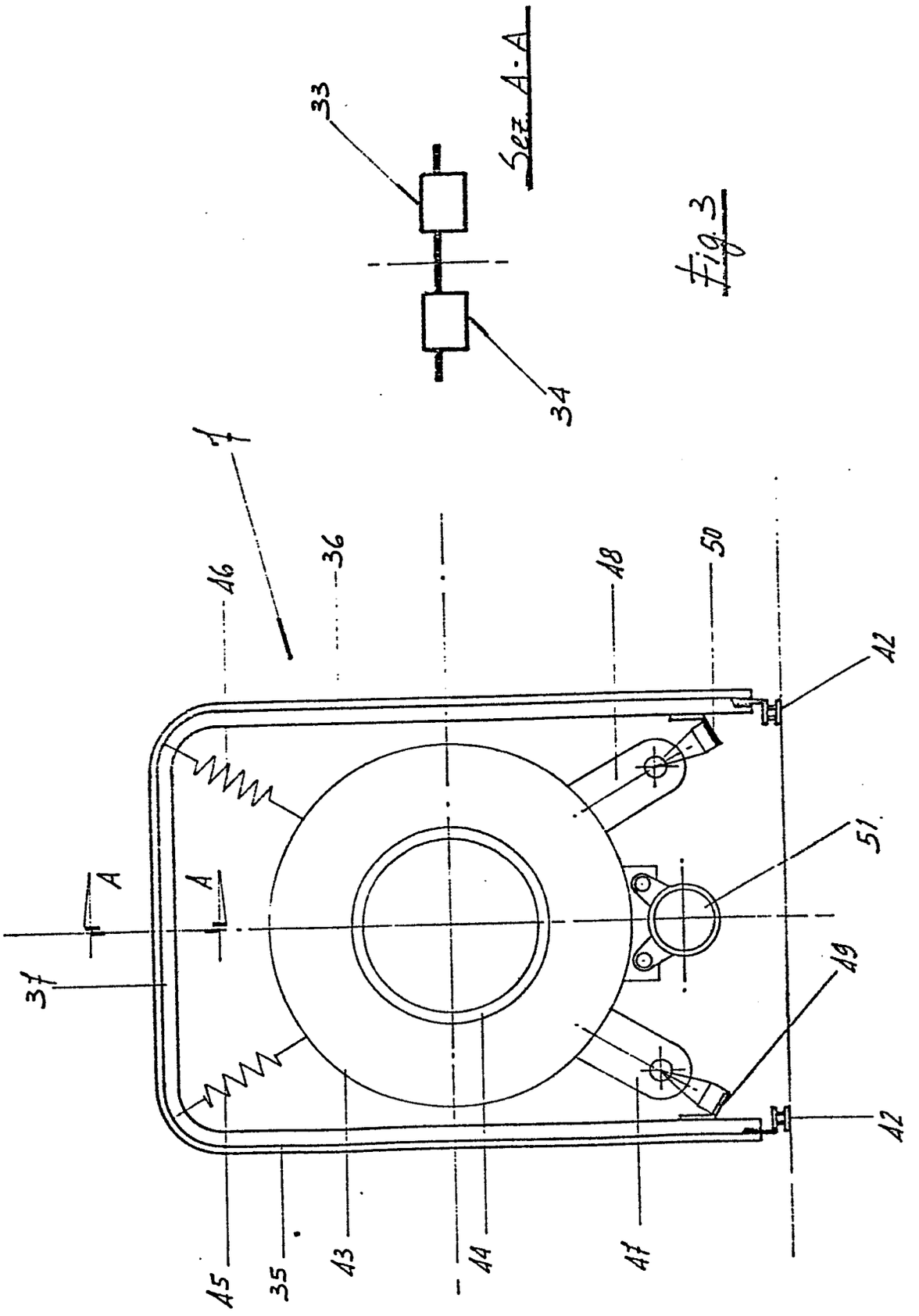

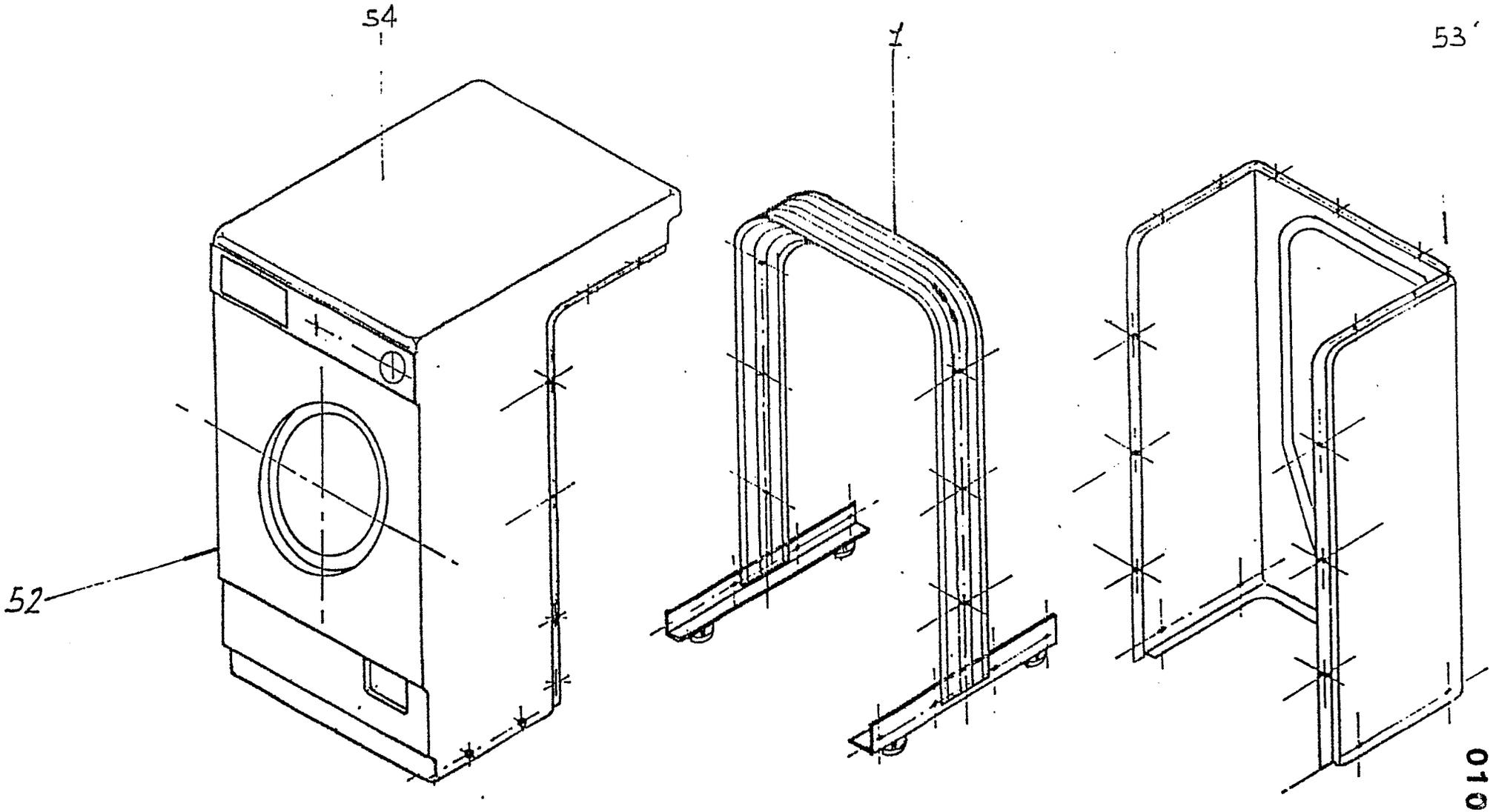

Fig. 4