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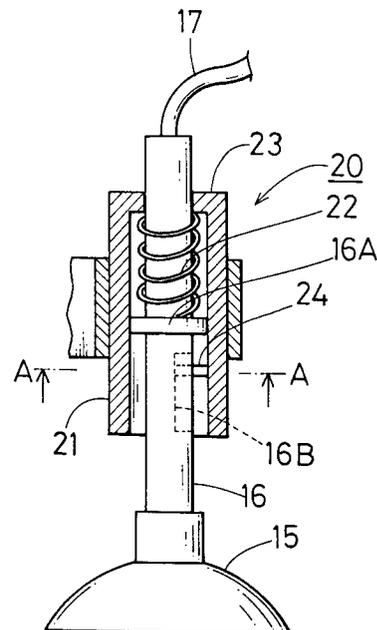
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54 **Method of and apparatus for attaching a masking member.**

57 A method of attaching a masking member which comprises engaging and transporting a masking member by a sucker (15) which is connected to a vacuum-ventilation tube (17) and is elastically energized forward; and attaching said masking member onto a predetermined part of an article.

**Fig. 1**



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The present invention relates to a method of attaching a masking member for use with a surface treatment or the like.

When a surface treatment is effected on the surface of an article, and if the surface of said article has a part (masking part) on which said surface treatment should not be effected, the part of the surface of said article may be covered and protected with a masking member. After said surface treatment, said masking member is detached from said part.

For example, in the coating of the underside of a car body or the like, there are more than 100 masking parts for one car body, and it takes much labor and time to attach the masking members to those parts and detach them manually. If such a process is involved in a continuous mass-production line, operations will be greatly hindered. Thus, an automatic detaching method for a masking member using a robot has been provided recently.

In the above-described automatic detaching method, a method in which a sucker which has been conventionally connected with a vacuum tube is mounted to a robot to engage a masking member by said sucker has been provided (Tokkai Hei No. 3-8473).

Further, in the above-described method, as shown in Fig. 12, the upper surface of a masking member (1) in which the mounting surface (3) of a plate-shaped body (2) is provided with an adhesive layer (4) is engaged and transported by means of a sucker (5) mounted to the end of a pipe (6) which is connected to a vacuum tube (7) in order to attach said masking member (1) onto a masking part (8A) of a member (8).

To automate the above-described method, the pipe (6) of the sucker (5) is mounted to a robot as mentioned above to move the sucker (5) via the pipe (6) to a position of engaging the masking member (1) by means of said robot, to transport it to a predetermined position after said masking member (1) is allowed to engage the sucker (5), and to press said masking member (1) against the masking part (8A) of the article (8) to attach said masking member (1) onto said masking part (8A) through an adhesive layer (4).

Nevertheless, in the above-described conventional method, the pressing force of the robot is directly exerted on the surface (3) of said masking member (1) to be attached, and said pressing force is difficult to be uniformly applied onto said attached surface (3) or said pressing force is concentrated on said attached surface (3), and there is the problem that it becomes difficult to firmly attach said masking member (1).

The present invention provides, a method of attaching a masking member, in which a masking member is engaged and transported by a sucker

which is connected to a vacuum-ventilation tube and is elastically energized forward, to be attached onto a predetermined part of an article.

In an embodiment of the invention in the engaging position of the masking member, the sucker is made vacuum through the vacuum-ventilation tube to allow said sucker to engage said masking member transport it to a predetermined position, and press it against the masking part of an article. At this juncture, since the masking member is elastically energized forward, the pressing force being exerted on the attached surface of said masking member is relaxed by the cushioning action of said elastic energizing means.

As a result, according to the present invention, when the masking member is attached, the pressing force is relaxed and made uniform, and therefore, it is possible to securely attach the masking member onto the masking part, thus, facilitating automation.

The present invention will be further described hereinafter with reference to the following description of exemplary embodiments and the accompanying drawings, in which:

Figs. 1 to 7 each show an embodiment of the present invention.

Fig. 1 is a sectional side elevation of an engaging device.

Fig. 2 is a cross-sectional view taken as like A-A of Fig. 1.

Fig. 3 is a bottom view of a sucker.

Fig. 4 is a perspective view showing a state of engaging a masking member.

Fig. 5 is a view illustrating a state of attaching a masking member.

Fig. 6 is a side sectional view of a masking member before being removed.

Fig. 7 is a side sectional view of a masking member after being removed.

Fig. 8 is a side view illustrating a state of attaching a masking member.

Fig. 9 is a side sectional view of a sucker.

Fig. 10 is a bottom view of a sucker.

Fig. 11 is a side view illustrating a state of removing a masking member.

Fig. 12 is a side view of the conventional embodiment of a masking member when said masking member is attached.

In the DRAWINGS:

50	(11), (31)	Masking member
	(20), (30)	Engaging device
	(15), (25)	Sucker
	(16), (26)	Pipe
	(17), (27)	Vacuum-ventilation tube
55	(18), (28)	Article
	(18A), (28A)	Masking part
	(22)	Spring
	(32)	Bellows portion

The present invention is described with reference to the embodiments shown in Figs. 1 to 7. In the masking member engaging apparatus (20) shown in Fig. 1, a sucker (15) is mounted to the tip of a pipe (16) which is connected to a vacuum-ventilation tube (17), said pipe (16) is slidably inserted in a cylinder (21) mounted to a robot (not shown in the Figure), and there is provided a spring (22) between the upper bottom (23) in said cylinder (21) and the flange (16A) at the end of the pipe (16).

On the peripheral surface of the pipe (16), there is formed a guide groove (16B) as shown in Fig. 2. In said guide groove (16B), a pin (24) projecting from the inner surface of the cylinder (21) is slidably fitted to thus check the rotation around the axis of the pipe (16), and also to prevent the pipe (16) from falling from the cylinder (21). Said sucker (15) is made of rubber or flexible plastic, and on the inside of said sucker (15), there are radially formed ribs (15C) from the central hole (15B) as shown in Fig. 3.

In the above-mentioned engaging device (20), the sucker (15) is made vacuum from the vacuum-ventilation tube (17) through the pipe (16) as shown in Fig. 4 to allow said sucker (15) to engage the upper surface of the masking member (11) at the engaging position thereof.

In this connection, since there are ribs (15C) formed in said sucker (15), collapse of said sucker (15) due to the suction force is prevented. If said sucker (15) is collapsed by the suction force, the vacuum-ventilation tube (17) will be blocked, thus making it difficult to allow said sucker (15) to securely engage the masking member (11).

The masking member (11) engaged by said engaging device (20) is transported to a predetermined position by a robot to press said masking member (11) against the masking part (18A) of the article (18) as shown in Fig. 5. At this juncture, said pressing force retracts the pipe (16) backward against the energizing force of the spring (22), and the pressing force is relaxed by the cushioning operation of said spring (22), so that said pressing force is not concentrated on said masking member (11) mounting surface (13), but made uniform. Thus, said masking member (11) is attached onto the masking part (18A) of said article (18) through the adhesive layer (14). Said masking member (11) is then disengaged from said sucker (15) by sending air through the vacuum-ventilation tube (17) of said engaging device (20).

After attaching the masking member (11) onto the masking part (18A) of the article (18) as mentioned above, a surface treatment such as coating, plating, metallic deposition, and phosphate treatment is effected on said article (18) to form a surface treating film (19). After said surface treatment is thus effected on said article (18), said

masking member (11) is detached from said masking part (18A) as shown in Fig. 7. In this case, the sucker (15) of the engaging device (20) is pressed against the upper surface of said masking member (11) as shown in Fig. 5.

At this juncture, the pressing force is relaxed and made uniform by the cushioning action of the spring (22) to allow the sucker (15) to securely engage the masking member (11). Also, since the collapse of said sucker (15) due to the suction force is made difficult to occur by the ribs (15C) as mentioned above, the surface treating film (19) adhering to the upper surface of said masking member (11) is not sucked into the pipe (16) through said sucker (15) to choke said sucker (15) and result in a blocked vacuum-ventilation tube (17).

In this way, the masking member (11) is engaged with the sucker (15) of the engaging device (20) to be detached from the masking part (18A), transported to a predetermined disposal place, and then said masking member (11) is disengaged from said sucker (15) by sending air through the vacuum-ventilation tube (17) of said engaging device (20), and at the same time, the surface treating film (19) accumulated in the pipe (16) is blown off for removal.

Figs. 8 to 11 each show another embodiment of the present invention. A masking member (31) in this embodiment is a plug-shaped one consisting of a flange portion (31A) and an inserting portion (31B), and an engaging device (30) in this embodiment has a sucker (25) having a bellows portion (32) mounted to the end of a pipe (26) connected to a vacuum-ventilation tube (27). Said sucker (25) is made of rubber or flexible plastic like in the previous embodiment and inside said sucker (25), a reinforcement layer (25A) having radial communicating holes (25C) for communicating with a central hole (25B) is provided as shown in Figs. 9 and 10, and said pipe (26) is mounted to a robot (not shown in the Figures).

In this embodiment, the masking member (31) engaged by the sucker (25) of the engaging device (30) is inserted in the hole (28A) of an article (28) as shown in Fig. 8, and the pressing force from the robot at this juncture is relaxed and made uniform by the elastic contraction of the bellows portion (32) of the sucker (25). After the surface treating film (29) is formed by the surface treatment, the masking member (31) is engaged with the sucker (25) of the engaging device (30) as shown in Fig. 11 to detach said masking member (31) from said hole (28A). In this case, the pressing force is also relaxed by the bellows portion (32) of said sucker (25).

Said sucker (25) is reinforced by a reinforcement layer (25A), preventing the sucker (25) from

being collapsed by the suction force which would block the vacuum-ventilation tube (27).

In the above-described embodiment, while the engaging device is also used to detach the masking member from the masking part, a hook or the like may be used instead of the engaging device. Also, for the sucker, a rigid material such as metal and rigid plastic may be used, and in such a case, the sucker is not collapsed by the suction force even if said sucker is without ribs or a reinforcement layer.

### Claims

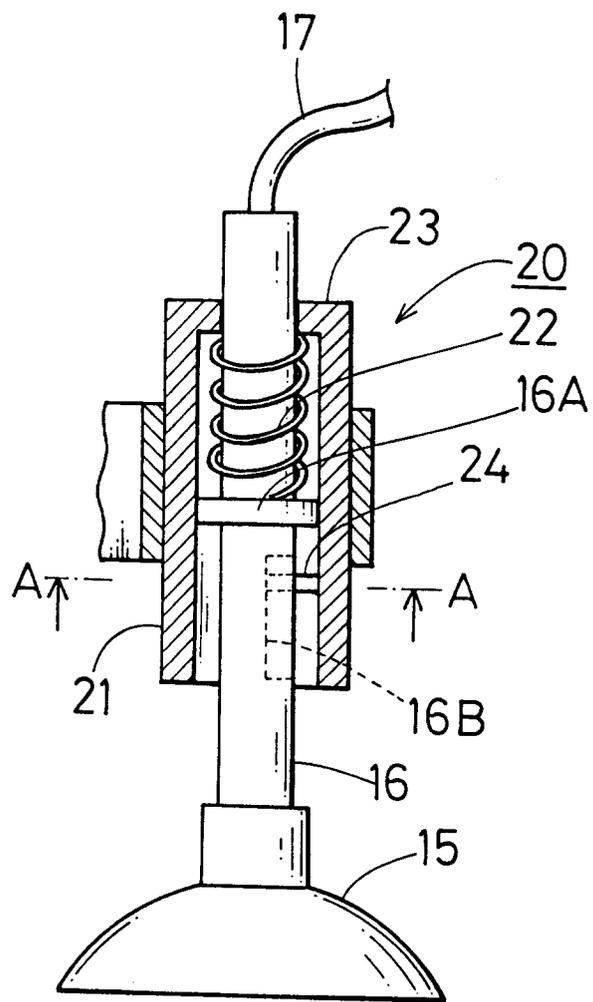
1. A method of attaching a masking member which comprises engaging and transporting a masking member by a sucker which is connected to a vacuum-ventilation tube and is elastically energized forward; and attaching said masking member onto a predetermined part of an article.
2. An apparatus for releasably holding a masking member, the apparatus comprising:
  - a sucker having an open end for holding said masking member,
  - a vacuum/ventilation device connected to said sucker for selectively evacuating it and supplying air thereto; and
  - biasing means for urging said sucker in the direction of its open end.
3. An apparatus according to claim 2 wherein said vacuum/ventilation device is connected to said sucker by an elongate flexible tube.
4. An apparatus according to claim 2 or 3 wherein said sucker is movably mounted on an arm and urged away therefrom by said biasing means.
5. An apparatus according to claim 2, 3 or 4 wherein said biasing means is a spring.

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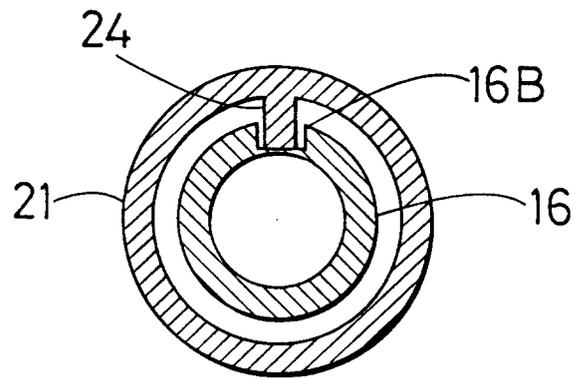
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Fig. 1



# Fig. 2



# Fig. 3

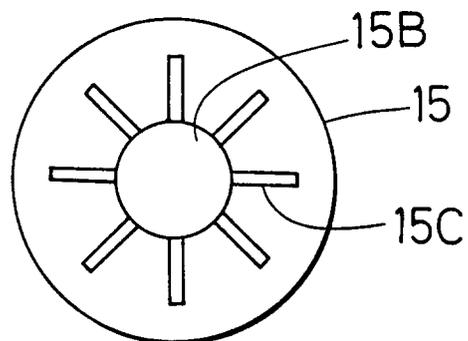
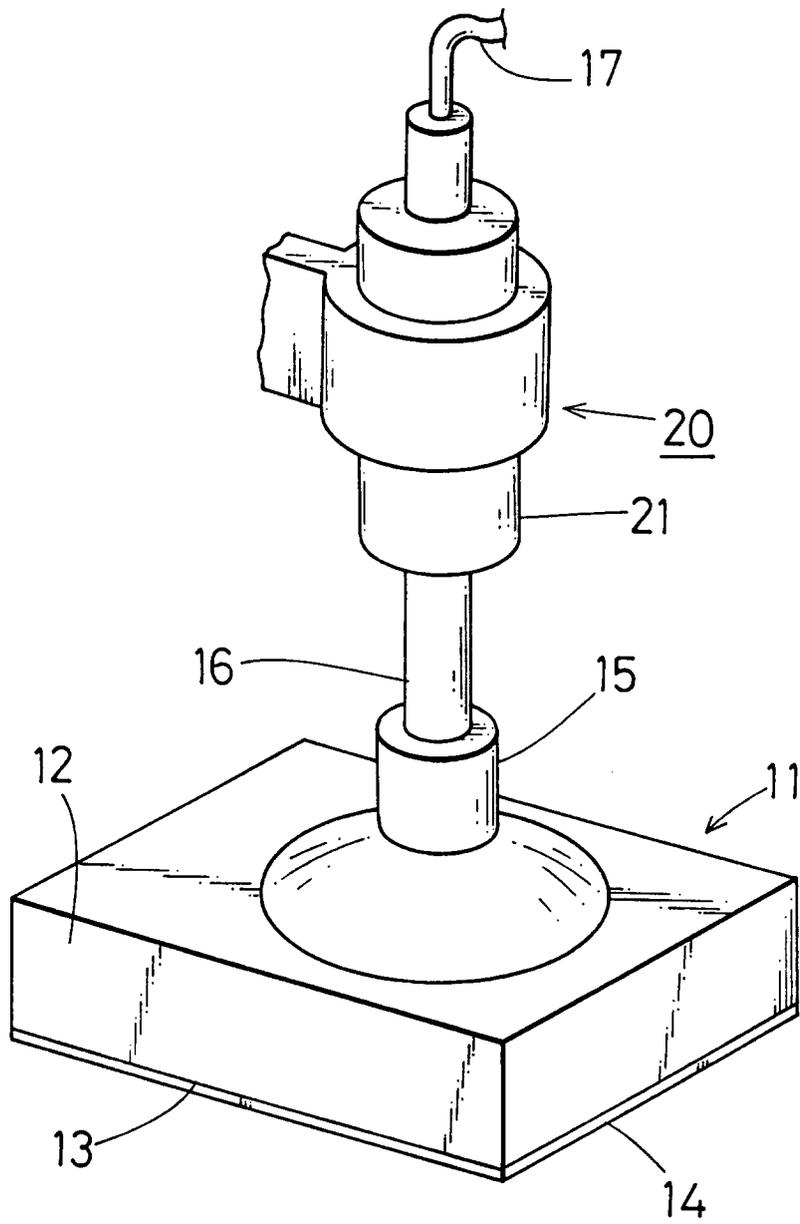


Fig. 4



# Fig. 5

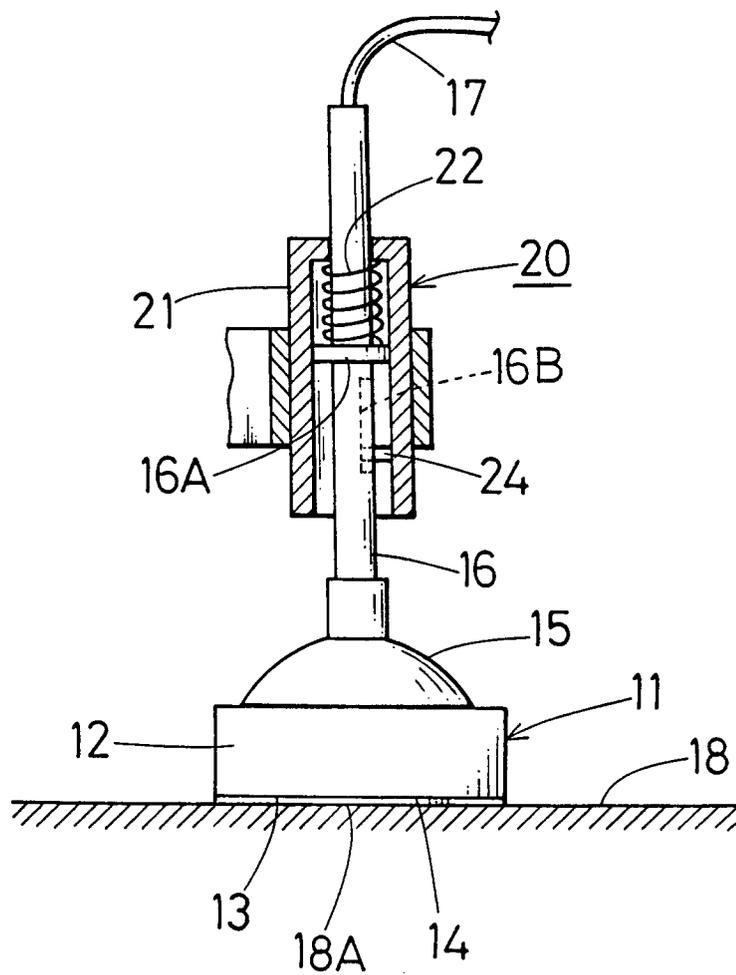


Fig. 6

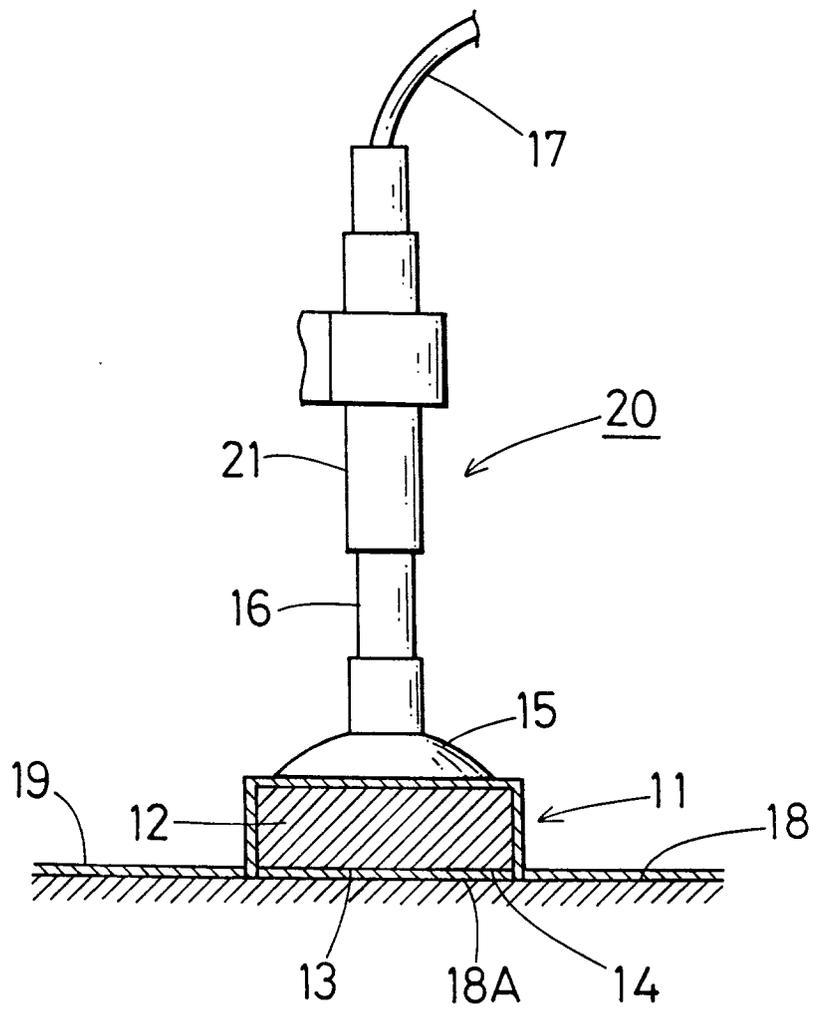


Fig. 7

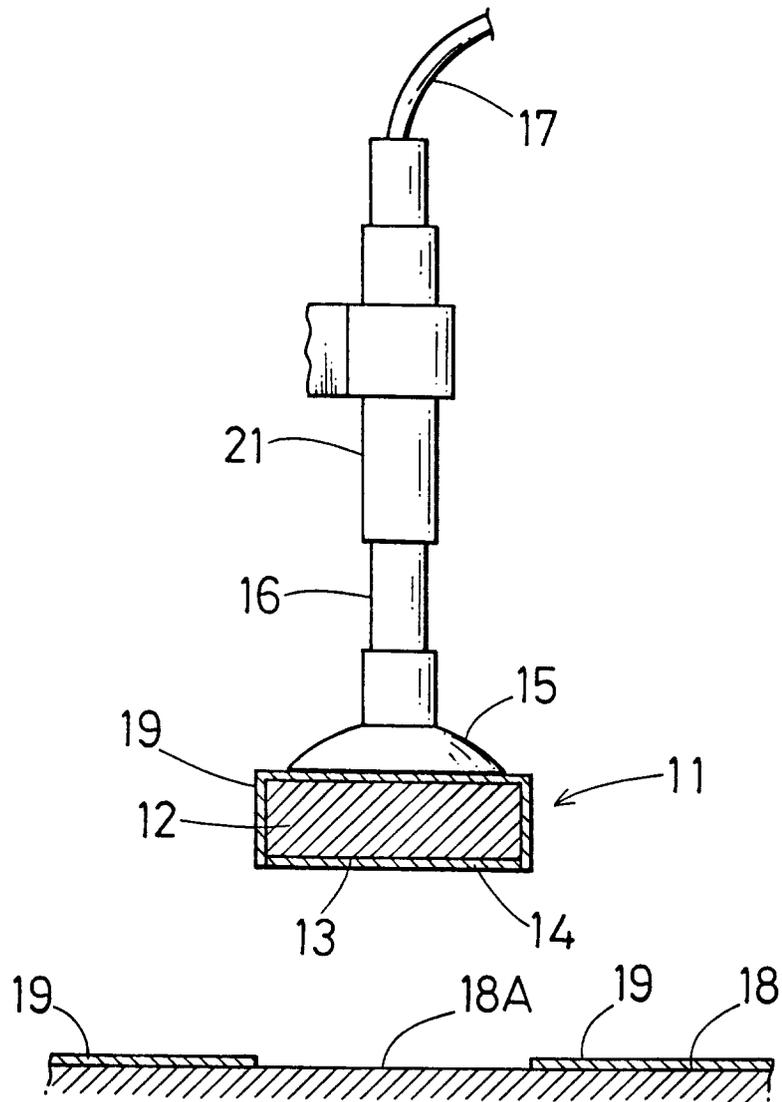


Fig. 8

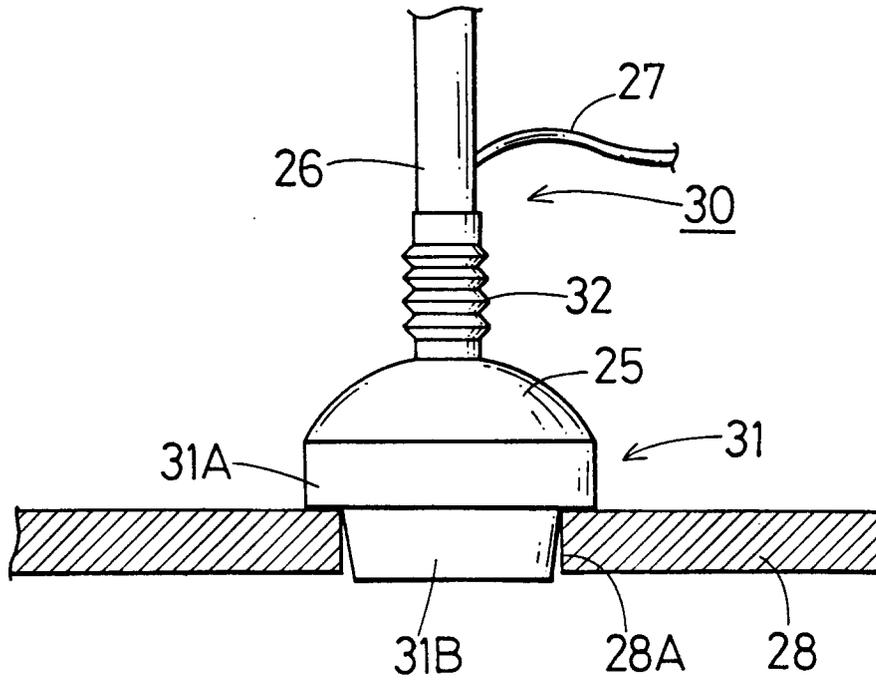
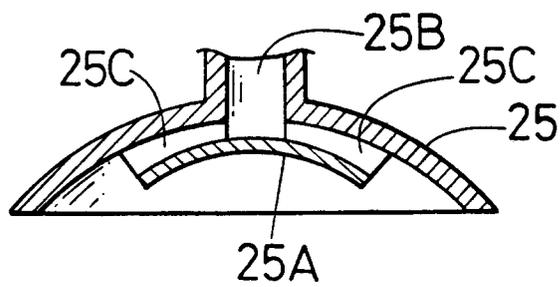
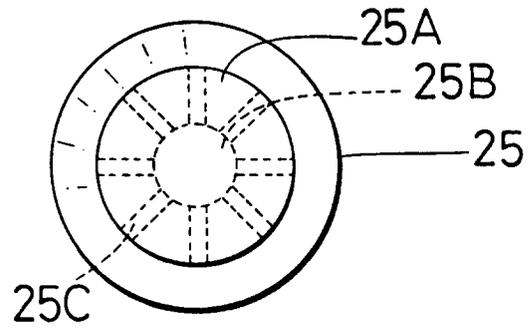


Fig. 9



# Fig. 10



# Fig. 11

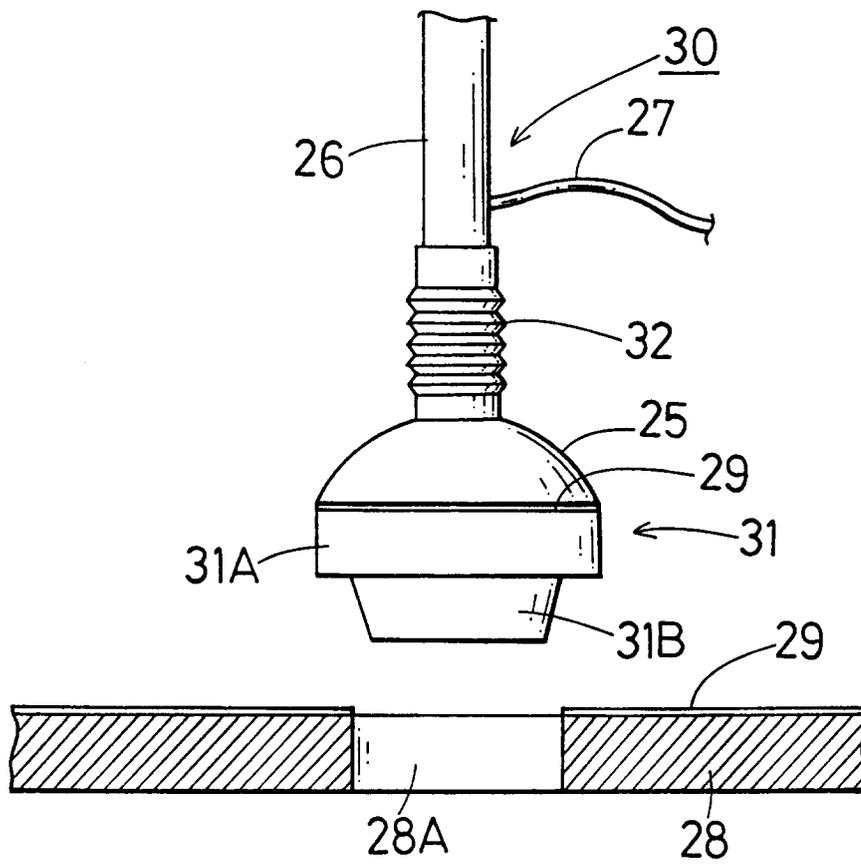
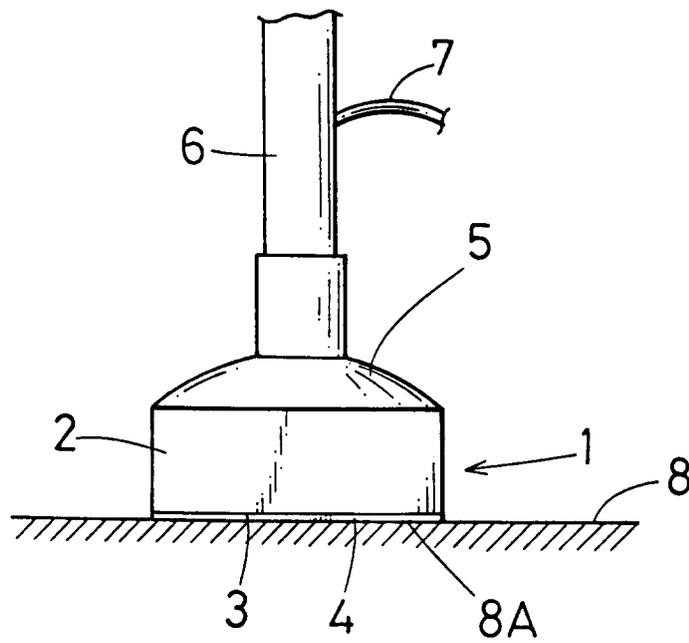


Fig. 12





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EUROPEAN SEARCH REPORT

Application Number

EP 92 31 1888

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)
Y,D	EP-A-0 401 043 (NAGOYA OILCHEMICAL CO., LTD.) * claims; figures *	1-5	B05B15/04
Y	PATENT ABSTRACTS OF JAPAN vol. 12, no. 333 (C-526)8 September 1988 & JP-A-63 093 370 ( TOYOTA MOTOR CORP. ) 23 April 1988 * abstract *	1-5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B05B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 AUGUST 1993	Examiner BREVIER F.J.
CATEGORY OF CITED DOCUMENTS		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	
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			

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