



(22) Date de dépôt/Filing Date: 2001/08/16

(41) Mise à la disp. pub./Open to Public Insp.: 2003/02/16

(51) Cl.Int.<sup>7</sup>/Int.Cl.<sup>7</sup> B29C 47/88, B29C 55/28

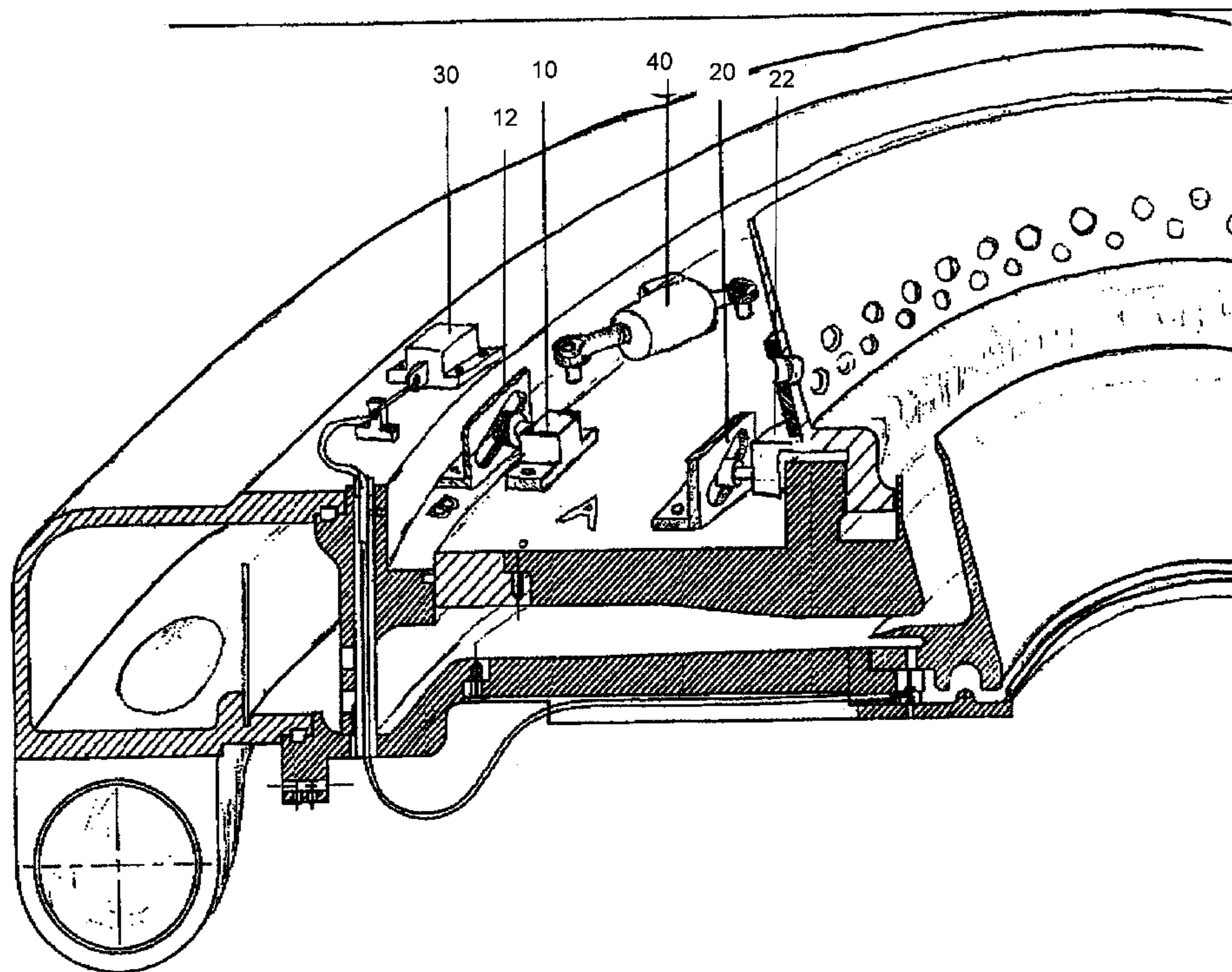
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(54) Titre : ANNEAU DE SOUFFLAGE D'AIR MOTORISE

(54) Title: MOTORIZED AIR RING



(57) Abrégé/Abstract:

A motorized air ring system for producing consistent high quality blown film is disclosed. More specifically, the individual adjustable component parts of an air ring, which are normally adjusted manually, are motorized. The controls will include an electrical/mechanical device designed to feedback and display, for the benefit of the operator, the exact location of the components at any given time relative to a set of standards or reference points. The motorization of the individual adjustable component parts of the air ring yields consistent repeatable results for producing consistent high quality blown film with minimum training for the machine operator. As a result, the producer attains improved manufacturing costs and functional end users of the blown film attain enhanced satisfaction.



**ABSTRACT**

A motorized air ring system for producing consistent high quality blown film is disclosed. More specifically, the individual adjustable component parts of an air ring, which are normally adjusted manually, are motorized. The controls will include an electrical/mechanical device designed to feedback and display, for the benefit of the operator, the exact location of the components at any given time relative to a set of standards or reference points. The motorization of the individual adjustable component parts of the air ring yields consistent repeatable results for producing consistent high quality blown film with minimum training for the machine operator. As a result, the producer attains improved manufacturing costs and functional end users of the blown film attain enhanced satisfaction.

## **MOTORIZED AIR RING**

### **FIELD OF THE INVENTION**

The present invention relates to the plastics industry. In particular, the present invention relates to the operation of air rings used in the manufacture of blown film following the extrusion of various poly resin materials.

### **BACKGROUND OF THE INVENTION**

Air ring adjustment is critical to the physical properties and production yield of the blown film process. Adjustment is typically performed by hourly paid workers and repeatability of adjustment can be difficult to achieve. Factors such as the ambient temperature, humidity, and the materials being processed all contribute to the adjustments needed to reach the desired and product quality or gauge.

Currently, many manufacturers record air ring settings to the best of their ability but this is a process of estimation and not an exact measurement because current methods rely on operator "feel" and observation of the bubble shape to achieve correct air ring adjustment, which leaves a great deal of uncertainty. Consequently production results vary from batch to batch frequently due to the air ring being improperly adjusted. This is

It is therefore desirable to provide an air ring that provides enhanced quality, consistent repeatable results, and greater operator comfort in actual manufacturing conditions. All of which translates into improved costs for the producer and enhanced satisfaction for the functional end user of the film.

### **SUMMARY OF THE INVENTION**

It is an object of the present invention to obviate or mitigate at least one disadvantage of the prior art. In particular, it is an object of the present invention to provide an air ring that is motorized and precisely controlled for producing consistent high quality blown film.

In a first aspect, the present invention provides an air ring. The air ring has positioning means for shifting components of the air ring and altering air flow through the air ring as a result thereof.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

Embodiments of the present invention will now be described, by way of examples only, with reference to the attached Figures, wherein

Figure 1 is a cross-sectional view of an air ring of the prior art;

Figure 2 is an orthogonal view of a cross-sectioned air ring according to an embodiment of the present invention; and,

Figure 3 shows magnified views of the cam and ramp components shown in Figure 2.

## **DETAILED DESCRIPTION**

A motorized air ring system for producing consistent high quality blown film is disclosed. More specifically, the individual adjustable component parts of an air ring, which are normally adjusted manually are motorized. The controls will include an electrical/mechanical device designed to feedback and display, for the benefit of the operator, the exact location of the components at any given time relative to a set of standards or reference points. The motorization of the individual adjustable component parts of the air ring yields consistent repeatable results for producing consistent high quality blown film with minimum training for the machine operator. As a result, the producer attains improved manufacturing costs and functional end users of the blown film attain enhanced satisfaction.

Figure 1 shows a cross sectional view of one side of an air ring of the prior art. The air receivers **1** are connected to a distribution manifold through a series of flexible hoses approximately four inches in diameter which deliver air to the chamber **2**. Air entry **1**, becomes part of the chamber **2**. The number of entries and their shape will vary in size relative to the size of the machine itself. The mixing and blending area reunites the air from the multiple hose supply into a single chamber. The chamber **2** itself is a cylindrical shape which accepts the tangential entry, and acts as a storage reservoir to reduce pulsation within the hoses. Seals **4** allow the chamber **2** to move independently from the rest of the air ring as many air rings rotate while the chamber **2** with hoses attached

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remains stationary. The fixed upper lip **3** which has a series of holes engineered to remove the tangential airflow and create a flow pattern directed straight to the exit. It is attached to fixed lower lip **7**, which is a foundation or primary support. The bottom lip **10**, attaches the exit parts on the lower side to the fixed upper lip. A manipulating air flow handle **5** controls the air flow through the bottom lip. An air control valve **11** is for the bottom lip. A forming cone **14** is fixed in the present embodiment, but may be removable or adjustable in alternative embodiments of the present invention. There are a number of holes positioned around the diameter of the larger area of the forming cone to permit air to pass through to the exit. This airflow is controlled by means of a valve, **11**, and manipulated from outside the chamber by a cable, **6**, or other such mechanism to increase or reduce the flow of air. The adjusting nut **8**, allows upper lip **9** to move vertically relative to a horizontal plane with the adjusting nut **8** being the fixed mechanism to locate parts **9**, **12**, **13** and keep them concentric. The upper lip **9**, is allowed to move vertically either up or down in relation to part **3** and therefore develop a venturi effect that is preferably required for gauging of the blown film extrusion. A gate **12** is mounted on a bubble cone **13**. Both the gate and the bubble cone have a series of holes that match each other. By rotating the gate the holes can be shut off completely, or proportionally opened to suit the necessary vacuum required by the blown film materials being extruded. The location of the bubble cone **13** moving up or down in relation to part **9** will develop a venturi effect that is preferably required for gauging of the blown film extrusion.

Therefore blown films manufactured with air rings of the prior art vary from batch to batch due to the air ring being improperly manually adjusted.

The motorized air ring according to an embodiment of the present invention is now described with reference to Figures 1,2 and 3. The motorized air ring of Figure 2 includes a cam unit **10** coupled to a ramp **12** adapted to communicate with the cam **10**, an air flow actuator **30** and an upper lip actuator **40**. There is bubble cone gate actuator, which is not shown, but is similar in construction to the upper lip actuator **40**. There is another cam unit **22** coupled to a ramp **20**. The upper lip actuator **40**, cam **10** and ramp **12** are height adjustment means.

In the present embodiment, the prior art air ring of Figure 1 does not require a complete redesign, but can be retro-fitted. In alternative embodiments, new motorized air rings can be manufactured to incorporate the necessary components to motorize an air

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ring, with minimal redesign. The thread between parts **8** and **3** in Figure 1 will be eliminated and replaced by a smooth machined surface. A ramp will be fixed on **8** and on **3**. An actuator or a pushing mechanism will be fixed between **8** and **3**. As the actuator changes length, it rotates as **8** interacts with **3**, sliding on the smooth surface. A change in height occurs as the ramp and cam actuates. This effect is more clearly illustrated in Figure 3. The above described process is applied on **3** and **8**, and **13** and **9**. A direct moving mechanism will pull or push the cable **6** instead of the manual handle **5** to change the air flow through the bottom lip by adjusting the gate **11**. An actuator fixed between **13** and **12** will slide **12** on **13** during the stroke, resulting in controlling the air through **12**. The angle of ramps **20** and **12** can be selected based on the level of degree of height adjustment control that is desired. All the actuators, ramps and cams for adjusting the air ring components are part of the air ring positioning means for altering the flow of air through the air ring as the components are shifted in position relative to each other.

Figure 3 illustrates the effect of a force  $F$  applied in the direction indicated by the arrow against part **A**. In **3b**, as force  $F$  is applied to part **A**, the cam unit begins to slide down the ramp. In **3a**, part **A** is at a relatively higher height than part **B**. In **3b**, parts **A** and **B** are at approximately the same height. In **3c**, part **A** is at a relatively lower height than part **B**. Accordingly, a force acting in the opposite direction of  $F$  against part **A** in **3c** will raise part **A** relative to part **B**.

In a preferred embodiment of the present invention, all actuators will feedback a signal to the control box indicating the part position. Therefore the settings become repeatable and all the moving parts are adjusted relative to a desired physical point. Those of skill in the art should understand that swapping placement of the cam unit **10** and ramp **12** will still allow the respective parts they are fixed to, to change height with respect to each other.

In operation, when the upper lip **9** is rotated with respect to the fixed upper nut **3**, a change in height will develop between them because the cam **10** moves either up or down the ramp **12**. A change in height will also develop between bubble cone **13** and bubble cone gate **12** when its actuator (not shown) rotates cone **13** with respect to gate **12**.

Although actuators such as upper lip actuator **40** is used to rotate the upper lip **9** relative to upper nut **3**, any means for moving the upper lip **9** relative to fixed upper nut **3** can be used. For example, cam unit **10** can be a motor driving a toothed wheel, and the

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ramp 12 can have complementary teeth in engagement with the toothed wheel. Additionally, the motorized air ring can be part of a system in which it is possible for the operator to recall specific adjustment settings for the air ring used in previous production time, to enable duplication of finished product end results. Furthermore, all the actuators can be electronically controlled as a system by a computer.

Therefore the motorized air ring according to the embodiments of the present invention will overcome difficulties in resetting the individual component parts relative to a physical position. It will deliver position repeatability, favourably effecting the production process and solving the uncertainty around positioning of the individual parts will aid the process of producing consistent high quality blown film with a minimum of training for the machine operator.

The above-described embodiments of the present invention are intended to be examples only. Alterations, modifications and variations may be effected to the particular embodiments by those of skill in the art without departing from the scope of the invention, which is defined solely by the claims appended hereto.

What is claimed is:

1. An air ring comprising:

positioning means for shifting components of the air ring and altering air flow through the air ring as a result thereof.

2. An air ring air flow controller comprising:

(a) means for moving a first part of an air ring relative to a second part of said air ring simultaneously in at least two dimensions with respect to each other, operably linked to;

(b) means for controlling air flow through said air ring.

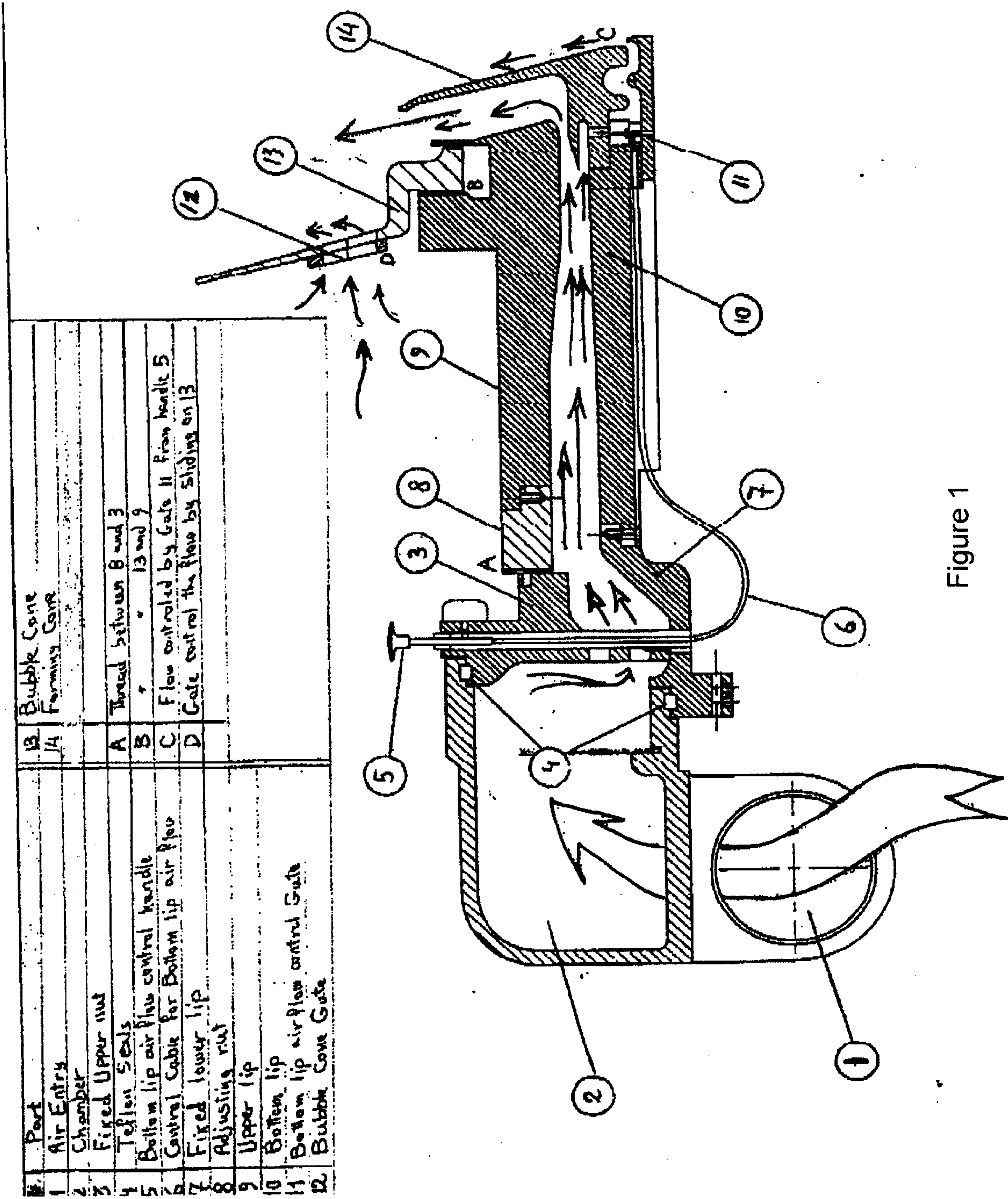


Figure 1

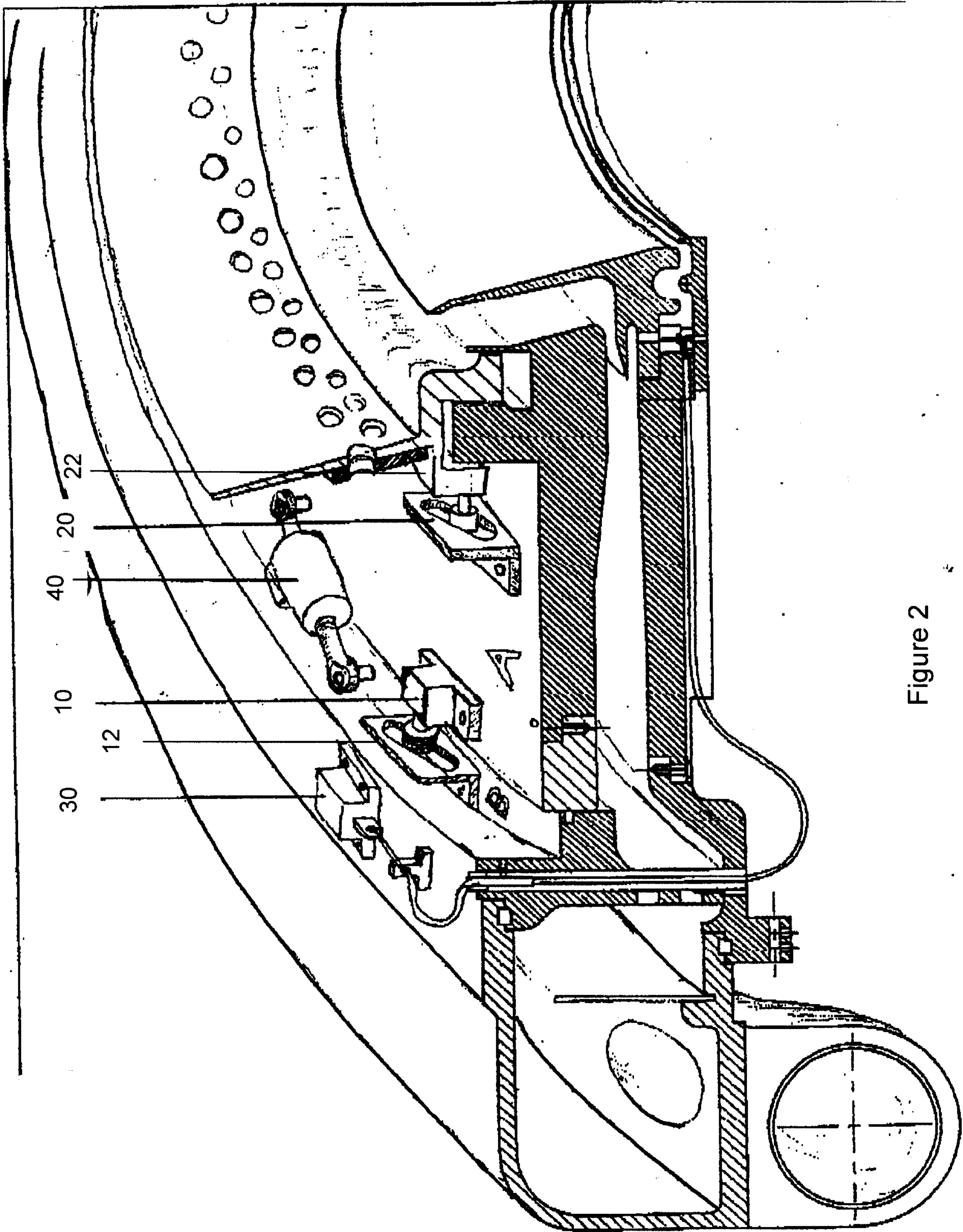
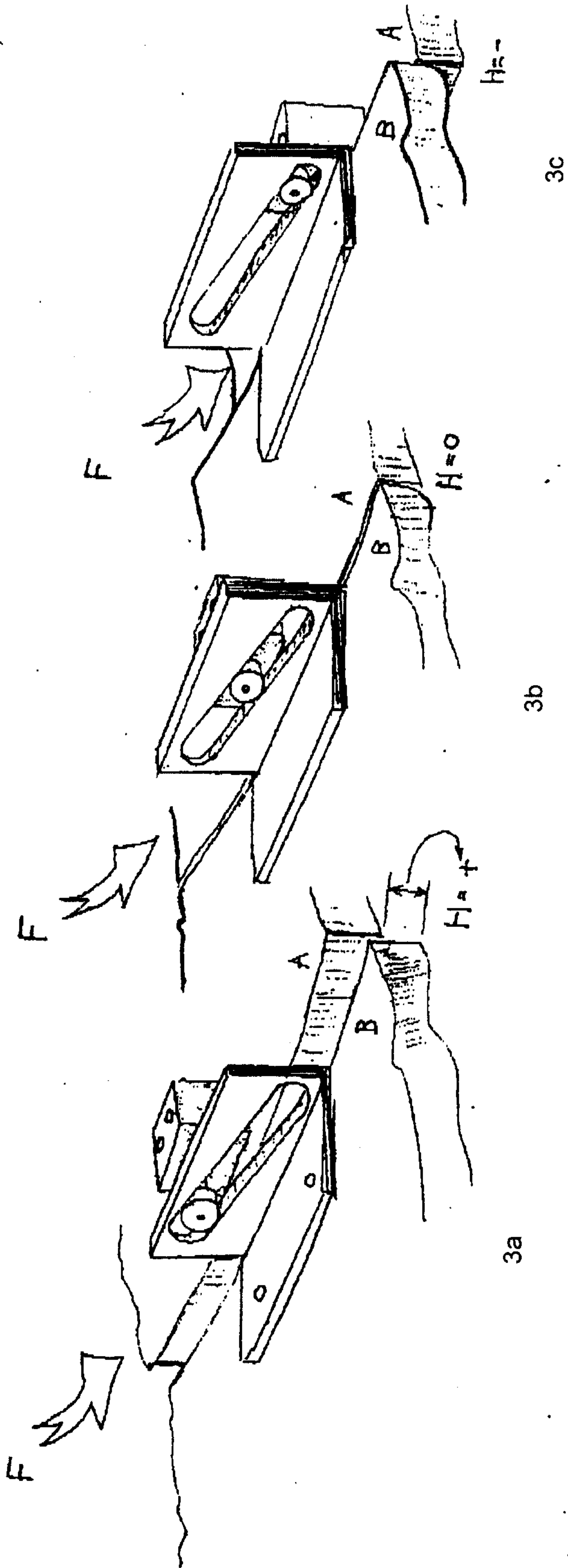


Figure 2

3/3



If we slide A on B using Force F  
 The cam and ramp system will force  
 for a change in H height

Figure 3

