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CA 2509870 C 2013/12/10

(11)(21) 2 509 870

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 2005/06/14

(41) Mise à la disp. pub./Open to Public Insp.: 2005/12/28

(45) Date de délivrance/Issue Date: 2013/12/10

(30) Priorité/Priority: 2004/06/28 (AT A 1095/2004)

(51) Cl.Int./Int.Cl. *D21F 5/02* (2006.01),
D21F 5/18 (2006.01)

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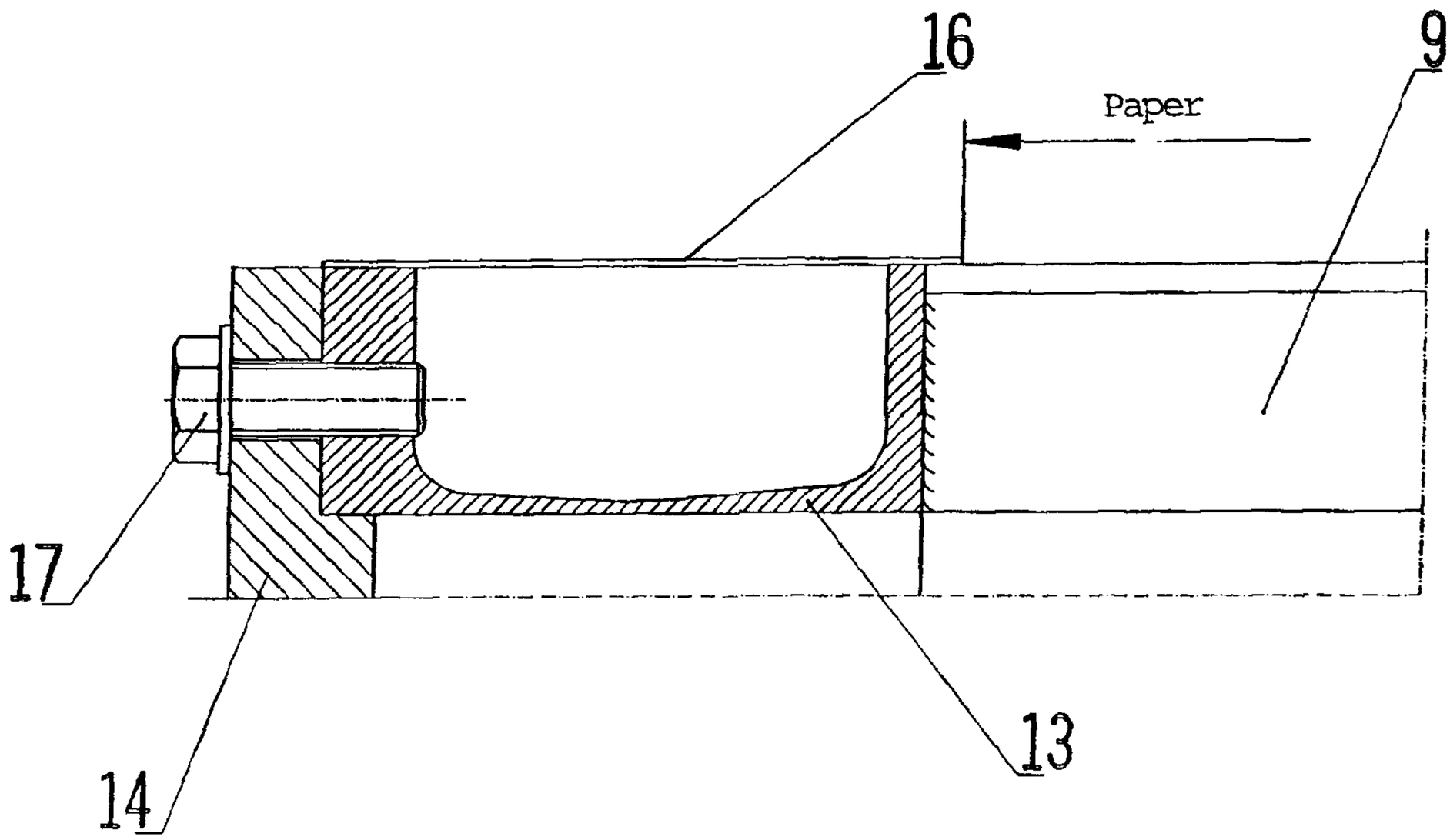
(54) Titre : DISPOSITIF DE SECHAGE CONTINU D'UN MATELAS DE PATE
(54) Title: DEVICE FOR CONTINUOUS DRYING OF A PULP WEB



(57) Abrégé/Abstract:
A device for continuous drying of a pulp web having an advantageous construction with improved structural durability is provided. The device comprises a drying drum and an air circulating system, wherein the drying drum has a cylindrical shell designed as a honeycombed body and the cylindrical shell is connected to end covers at each edge. In particular, the honeycombed cylinder shell of the drying drum comprises an annular, flexible transition profile at the edges, which is designed as a U-profile.

ABSTRACT

A device for continuous drying of a pulp web having an advantageous construction with improved structural durability is provided. The device comprises a drying drum and an air circulating system, wherein the drying drum has a cylindrical shell designed as a honeycombed body and the cylindrical shell is connected to end covers at each edge. In particular, the honeycombed cylinder shell of the drying drum comprises an annular, flexible transition profile at the edges, which is designed as a U-profile.

DEVICE FOR CONTINUOUS DRYING OF A PULP WEB

The invention relates to a device for continuous drying of a pulp web, particularly a tissue web, with a drying drum and an air circulating system, where the drying drum has a cylindrical shell designed as a honeycombed body.

In conventional tissue plants, the drying process begins at an ingoing dryness of some 40 to 45%. In order to achieve higher paper volume, papermakers now dispense with preliminary mechanical dewatering, and the ingoing dryness of this type of device nowadays is around 20 to 25%. These plants operate with through-air drying. During the heating process, one or more consecutive through-air drying drums at ambient temperature are exposed abruptly to the supply air temperature of approximately 300°C. The drying drums currently in use have a thin-walled shell, for example a perforated or honeycombed body, that is joined to thick-walled end flanges. Due to the substantial differences in mass between drum shell and end flange, there is excessive stress at the transition points that leads to deformation and even structural damage. The same damage occurs if the drums are cooled down abruptly from operating to ambient temperature during an emergency shutdown, when they are sprayed with cold water in order to prevent the plastic wires enclosing the drums from being damaged.

The invention now aims to eliminate this disadvantage and is characterised by the honeycombed cylinder shell of the drying drum having an annular, flexible transition profile at the edges. Thus, any changes occurring in diameter and any resulting inadmissible thermal stress can be reduced.

According to an embodiment of the present invention, there is provided a device for continuous drying of a pulp web comprising a drying drum and an air circulating system, wherein the drying drum is a cylindrical shell comprising a honeycombed body and is connected to end covers at each edge, wherein the honeycombed cylindrical shell of the drying

drum comprises an annular, flexible transition profile at the edges, which is designed as a U-profile.

An advantageous further development of the invention is characterised by the transition profile being designed as a U-profile and preferably being butt-welded onto the honeycombed cylinder shell. With this design of transition piece, continuous heat transition is guaranteed during both the heating and the cooling process of the machine. The special type of joint

leads to a reduction of the stresses in the welds to such extent that the welds suffer no deformation or structural damage at all.

A favourable embodiment of the invention is characterised by the cross-section of the transition profile, preferably a U-profile, narrowing towards its centre. As a result, the heat flow can be influenced particularly well. In addition, this design creates a flexible connection, which also guarantees that the cylinder shell is centred and thus, runs exactly true.

It is an advantage if the honeycombed cylinder shell is broader than the paper web to be dried, thus allowing a defined variation of the paper web width.

A favourable further development of the invention is characterised by an endless ring being shrunk on at each end and which extends beyond the transition profile and into the honeycombed cylinder shell. This thus prevents dust or fibres from entering the cavity of the U-profile.

It has proved favourable to make the cylinder shell out of longitudinal ribs that are connected to upright, edged profiles. This achieves good stability in the cylinder shell.

A favourable embodiment of the invention is characterised by the longitudinal ribs of the honeycombed cylinder shell being spaced at a distance of between 20 and 80 mm from one another, preferably between 30 and 40 mm. If the spacing is narrower, there is also less specific load and thus, reduced risk of marks on the paper web.

An advantageous embodiment of the invention is characterised by the edged connecting profiles mounted in a honeycombed pattern protruding beyond the longitudinal ribs and supporting the paper web and the

conveying wire. This results in a large supporting surface and a further reduction in the risk of marks on the paper web.

It is particularly favourable if the honeycombed cylinder shell has an open area of at least 85%. The through-air drying process can thus be implemented particularly well.

A particularly favourable further development of the invention is characterised by covers being provided on the face ends to stabilize the cylinder shell and by these covers being bolted to the cylinder shell, particularly to the transition pieces. This design guarantees improved stability of the drum shell; in particular, it prevents any sliding movement by the end cover and the drum shell if there is radial expansion caused by the temperature.

An advantageous embodiment of the invention is characterised by the drying drum having a fully welded drum body. This design virtually excludes the risk of any areas where cracks could occur.

The invention will now be described in examples and referring to the drawings, where Fig. 1 shows a variant of a configuration of a through-air drying unit, Fig. 2 a sectional view through Fig. 1 along the line marked II-II, Fig. 3 shows a drying drum according to the invention, Fig. 4 shows Detail IV in Fig. 3, Fig. 5 shows Detail V in Fig. 3, and Fig. 6 a sectional view along the line marked VI-VI in Fig. 3.

Figure 1 shows a possible configuration of a through-air drying process. The figure shows the drum 1 with its bearings 2 and 3, and the drive 4.

Beneath the drum there is a two-part hood 5 and 6 (see Fig. 2) from which the hot supply air flows through the paper web 7, through a conveying wire 8, then through the drying drum 1 into the inside of the drum, and is removed from the drum on the drive side through an annular channel 10. The hot supply air at a temperature of approximately 300°C is cooled down to approximately 120°C by the drying process. The exhaust air cooled in this way is then returned to its entry status in a processing system. At the outlet, the paper web 7 with the conveying wire 8 is carried over a deflection roll 11. The cover device 12 is clearly visible here, covering the area of the drum 1 from the inside outwards in the sector that does not come into contact with the tissue web 7 and which also is not enclosed by the hood 5 and 6. This prevents additional air from being drawn into the drying drum, which would greatly reduce the suction effect through the paper web. In principle, the air can also be conveyed from the inside of the drying drum 1 through the cylinder shell 9 to the outside.

Figure 3 shows a sectional view through a drying drum 1, comprising a honeycombed cylinder shell 9 with a flexible ring 13 rolled into a horizontal U-profile, butt-welded onto both the operator and the drive side. Due to this U-shaped transition profile 13 between cylinder shell 9 and flange, the maximum stresses in the connecting weld are reduced to approximately one third of those occurring in conventional designs, which guarantees damage-free operation of the drying drum over its entire service life.

The external flanges of these flexible rings 13 are bolted to the drum covers 14 and 15, which have journals to hold the two bearing assemblies 2 and 3 that are designed to take account of the changing length of the drying drum 1 in cross-machine direction, caused by the differences in temperature during heating up and cooling down. The temperature of the exhaust air is normally around 120°C, while the supply

air entering the drying drum has a temperature of approximately 300°C. The two ends of the drum are covered by an endless ring 16 from their outer edge up to the edges of the paper web. This arrangement prevents any dust or fibres from entering the cavity in the U-profile. This endless ring 16 is shrunk on in such a way that it cannot detach itself from the drum surface during the heating and cooling process, nor during drying operation.

Figure 4 shows a sectional view of the connection between the drum shell and the flexible ring 13, as well as the weld joint itself and the flange connection 17 to the drum cover 4.

A view of the peripheral sector of the drum 1 is illustrated in Figure 5. This drawing shows the covering ring 16, which extends beyond the edges of the honeycombed cylinder shell 9 and marks the edges of the paper web.

Figure 6 shows the supporting structure of the cylinder shell 9 with longitudinal ribs 18, with advantageous spacing a of approximately 30 to 40 mm and the connecting profiles 19 protruding beyond the longitudinal ribs in radial direction to form the honeycomb and support the paper web 7 and the conveying wire 8.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A device for continuous drying of a pulp web comprising a drying drum and an air circulating system, wherein the drying drum is a cylindrical shell comprising a honeycombed body and is connected to end covers at each edge, wherein the honeycombed cylindrical shell of the drying drum comprises an annular, flexible transition profile at the edges, which is designed as a U-profile.

2. A device according to claim 1, wherein the U-profile is buttwelded onto the honeycombed cylinder shell.

3. A device according to claim 1 or 2, wherein a cross-section of the U-profile narrows towards its centre.

4. A device according to any one of claims 1 to 3, wherein the honeycombed cylindrical shell is broader than the paper web to be dried.

5. A device according to any one of claims 1 to 4, further comprising, an endless ring shrunk on at each end which extends beyond the transition profile and over the honeycombed cylindrical shell.

6. A device according to any one of claims 1 to 5, wherein the cylinder shell is made out of longitudinal ribs that are connected to connecting profiles, protruding beyond the longitudinal ribs in a radial direction to form the honeycombed body.

7. A device according to claim 6, wherein the longitudinal ribs of the honeycombed cylinder shell are spaced at a distance (α) of between 20 and 80 mm from one another.

8. A device according to claim 6 or 7, further comprises edged connecting profiles mounted in a honeycombed pattern and protruding beyond the

longitudinal ribs, wherein the edged connecting profiles support the paper web and a conveying wire.

9. A device according to any one of claims 1 to 8, wherein the honeycombed cylindrical shell comprises an open area of at least 85%.

10. A device according to any one of claims 1 to 9, wherein the end covers are provided on the face ends to stabilize the cylinder shell and are bolted to the transition pieces.

11. A device according to any one of claims 1 to 10, wherein the drying drum comprises a fully welded drum body.

12. A device according to any one of claims 1 to 11, which is configured for continuous drying of a tissue web.

Fig. 1

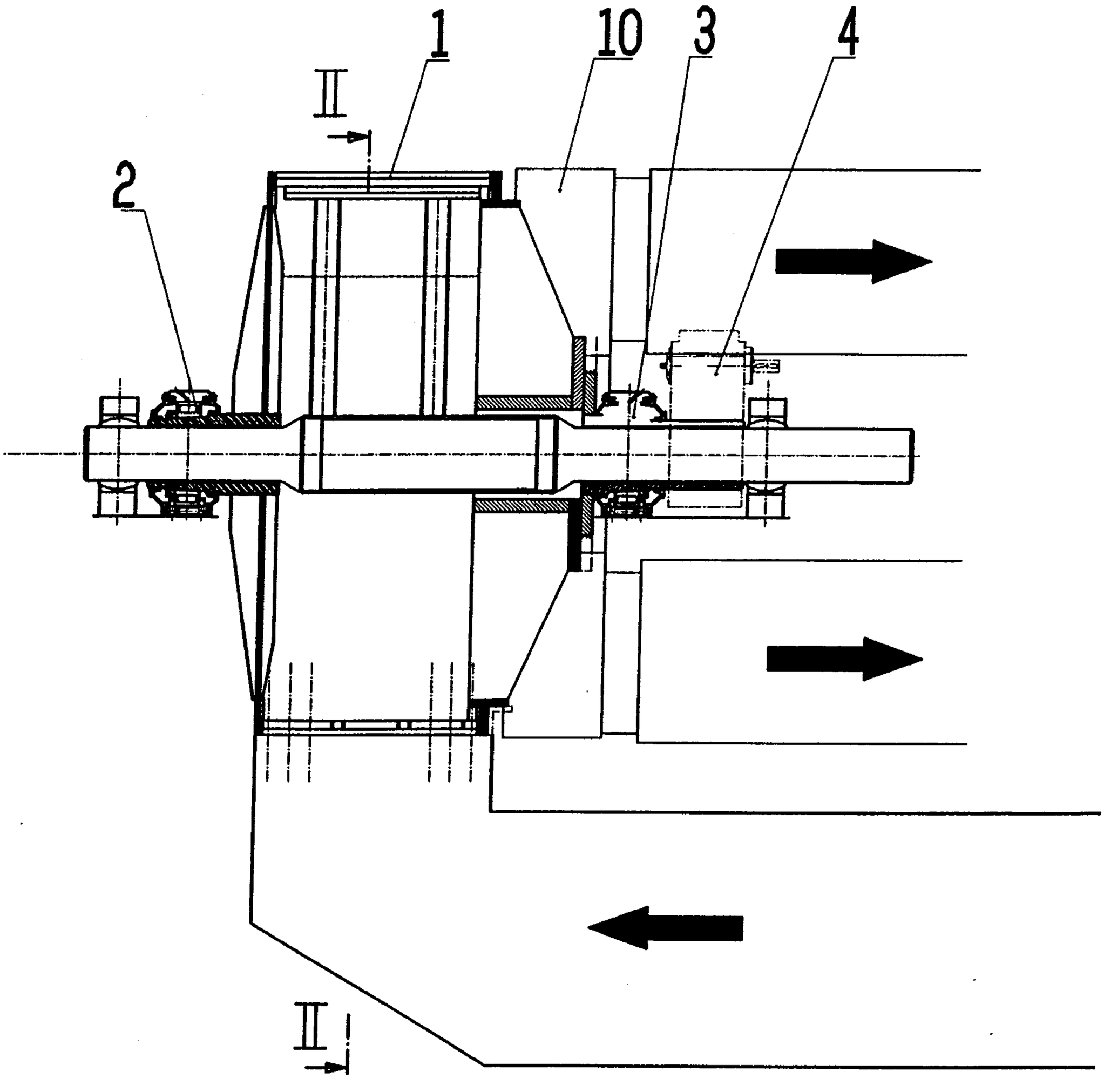


Fig. 2

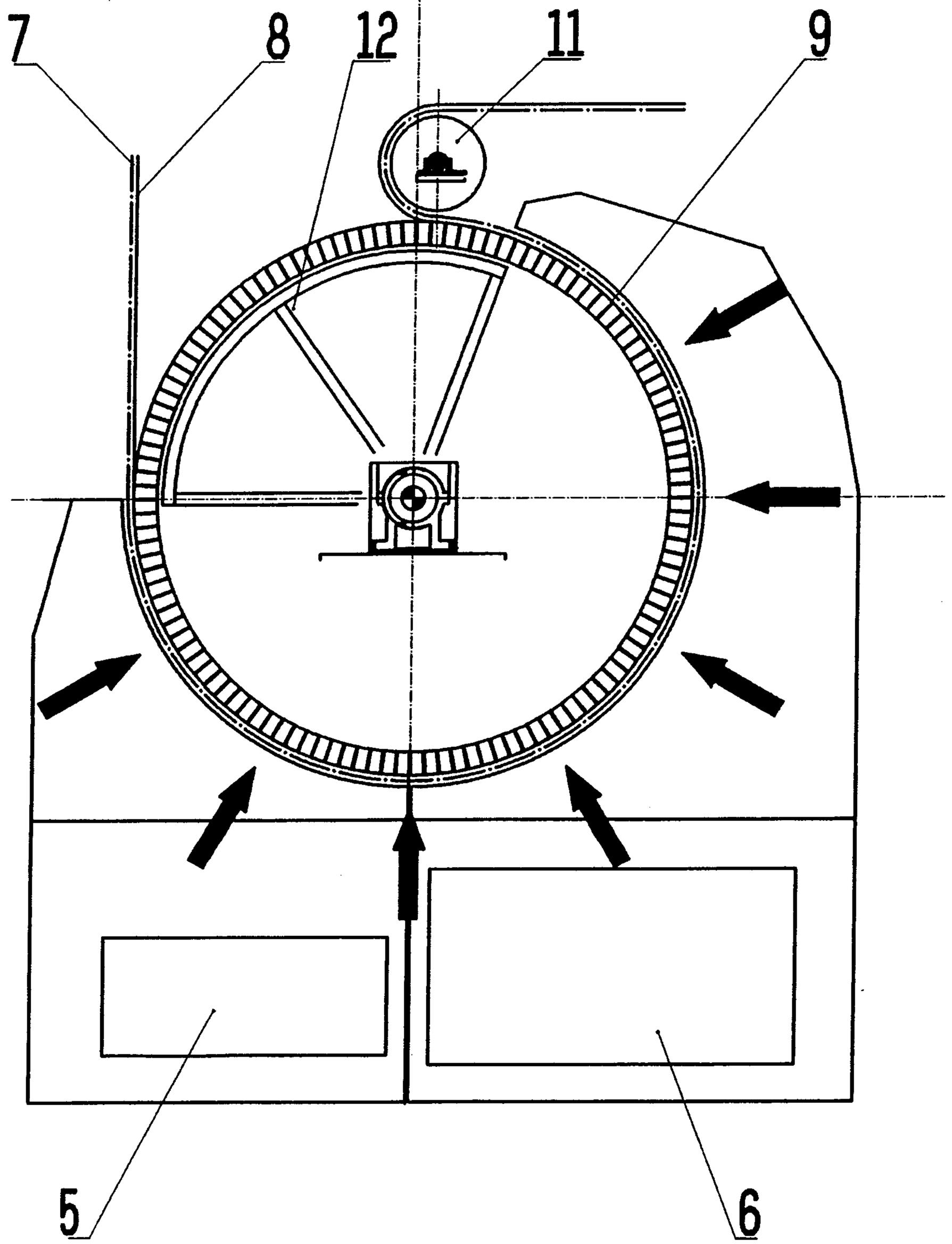


Fig. 3

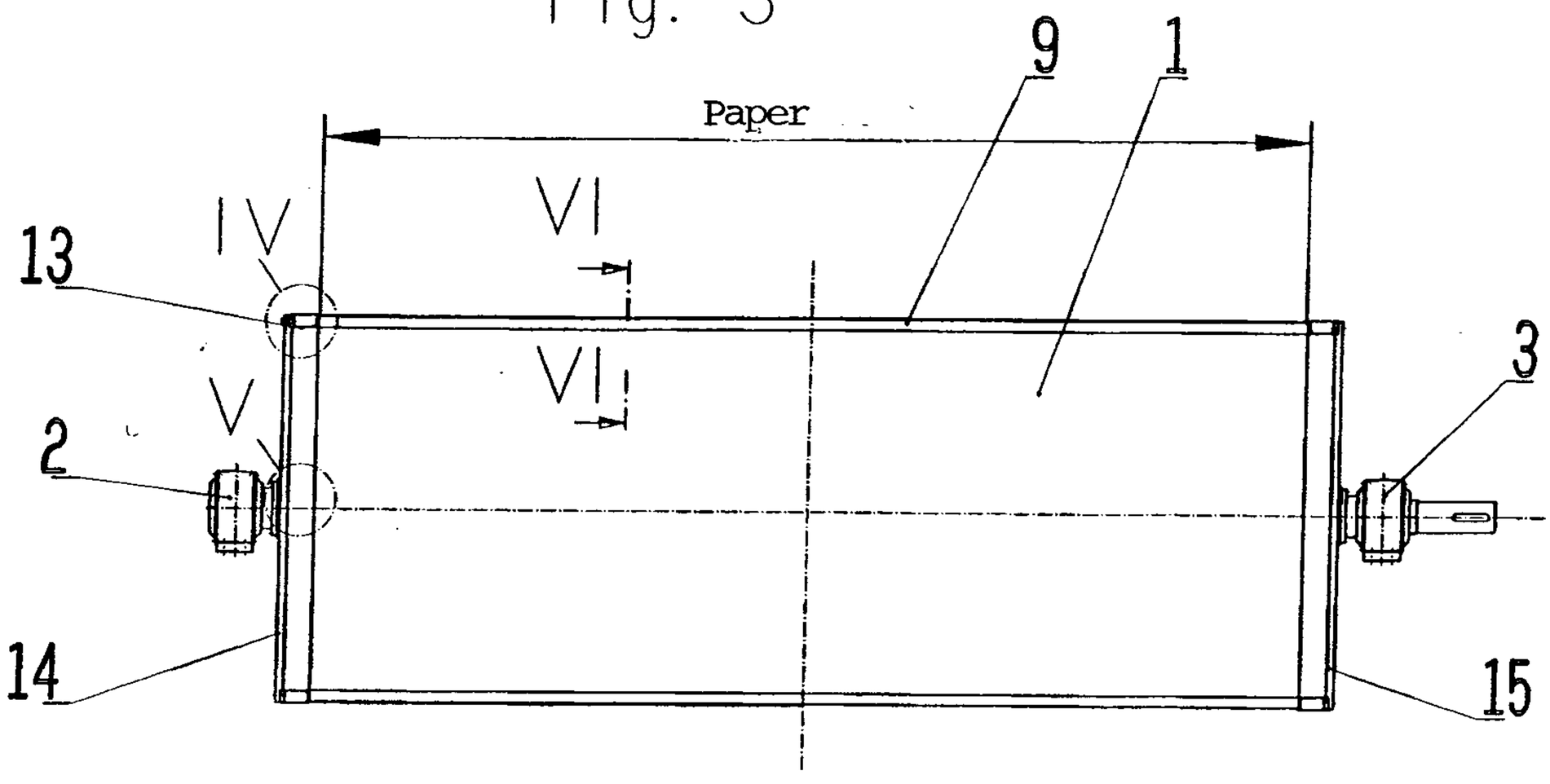


Fig. 4

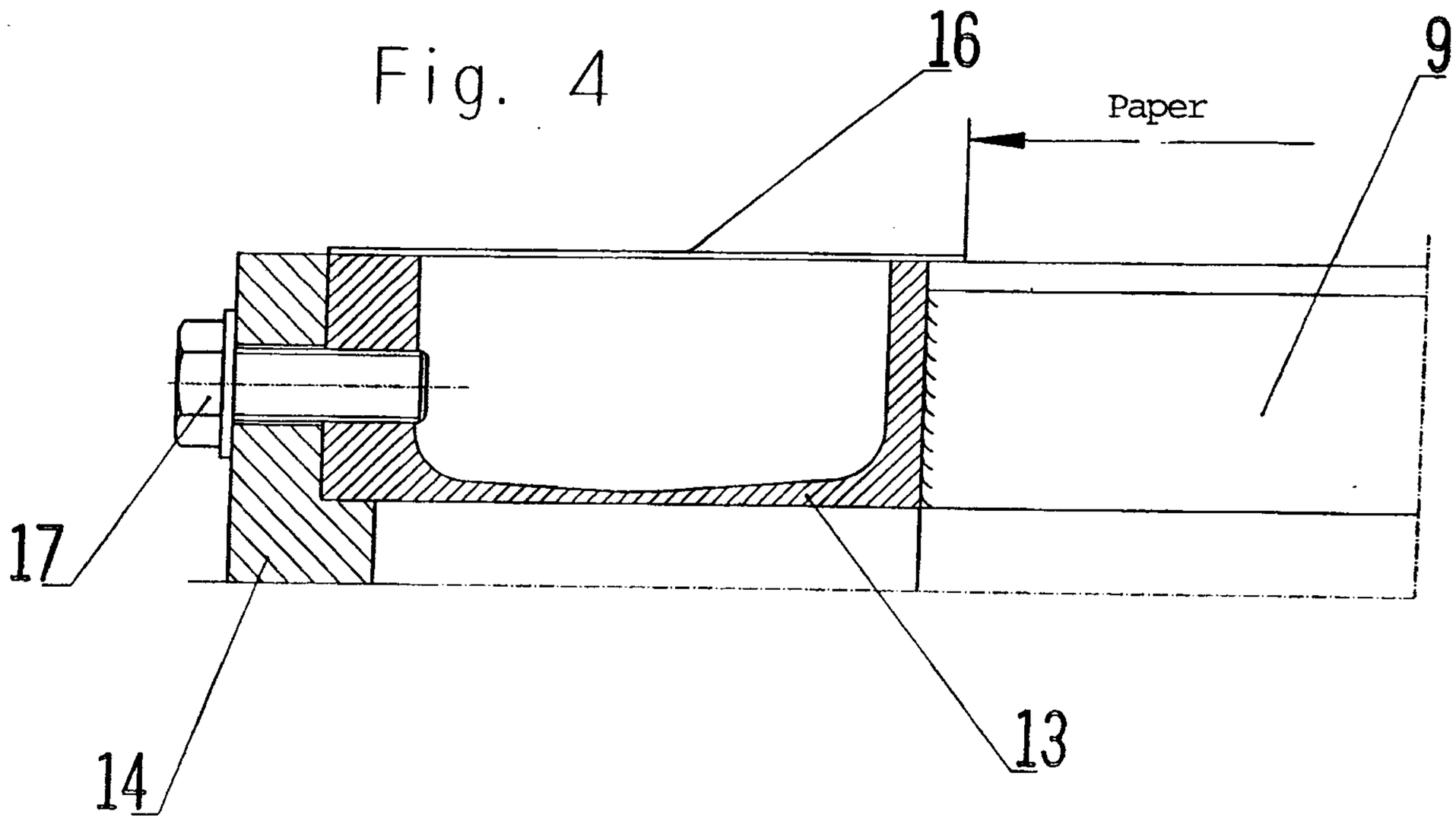


Fig. 5

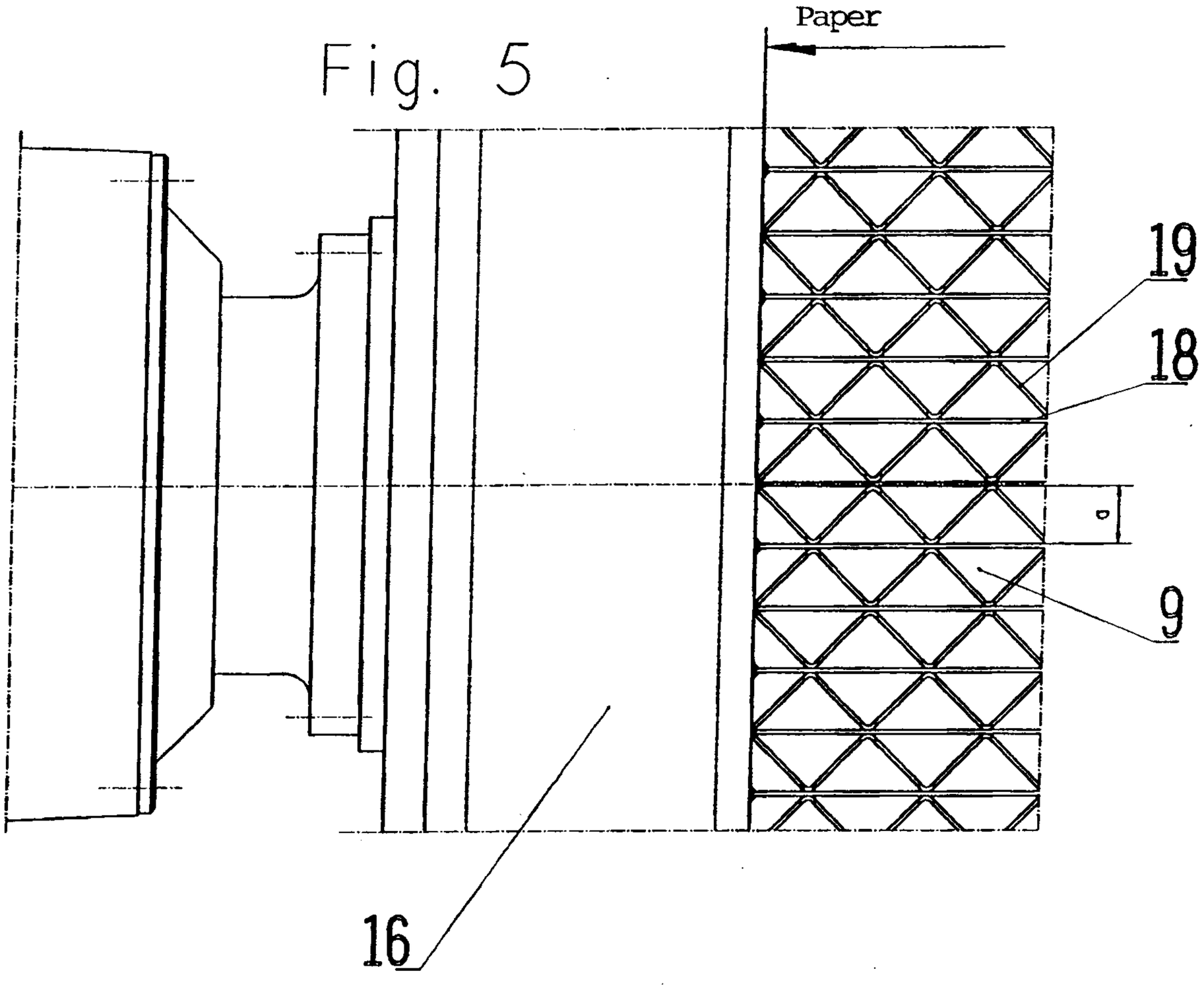
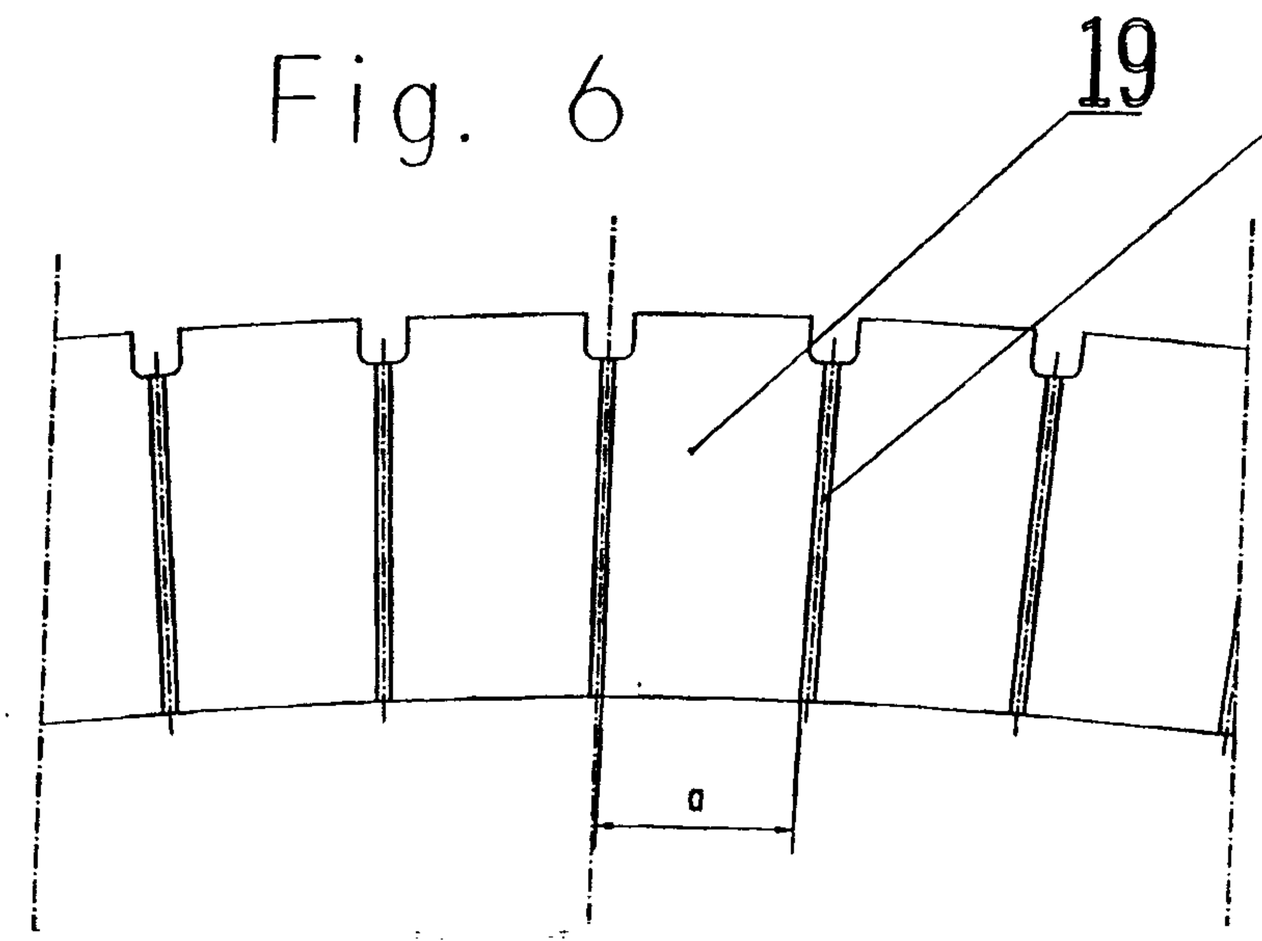
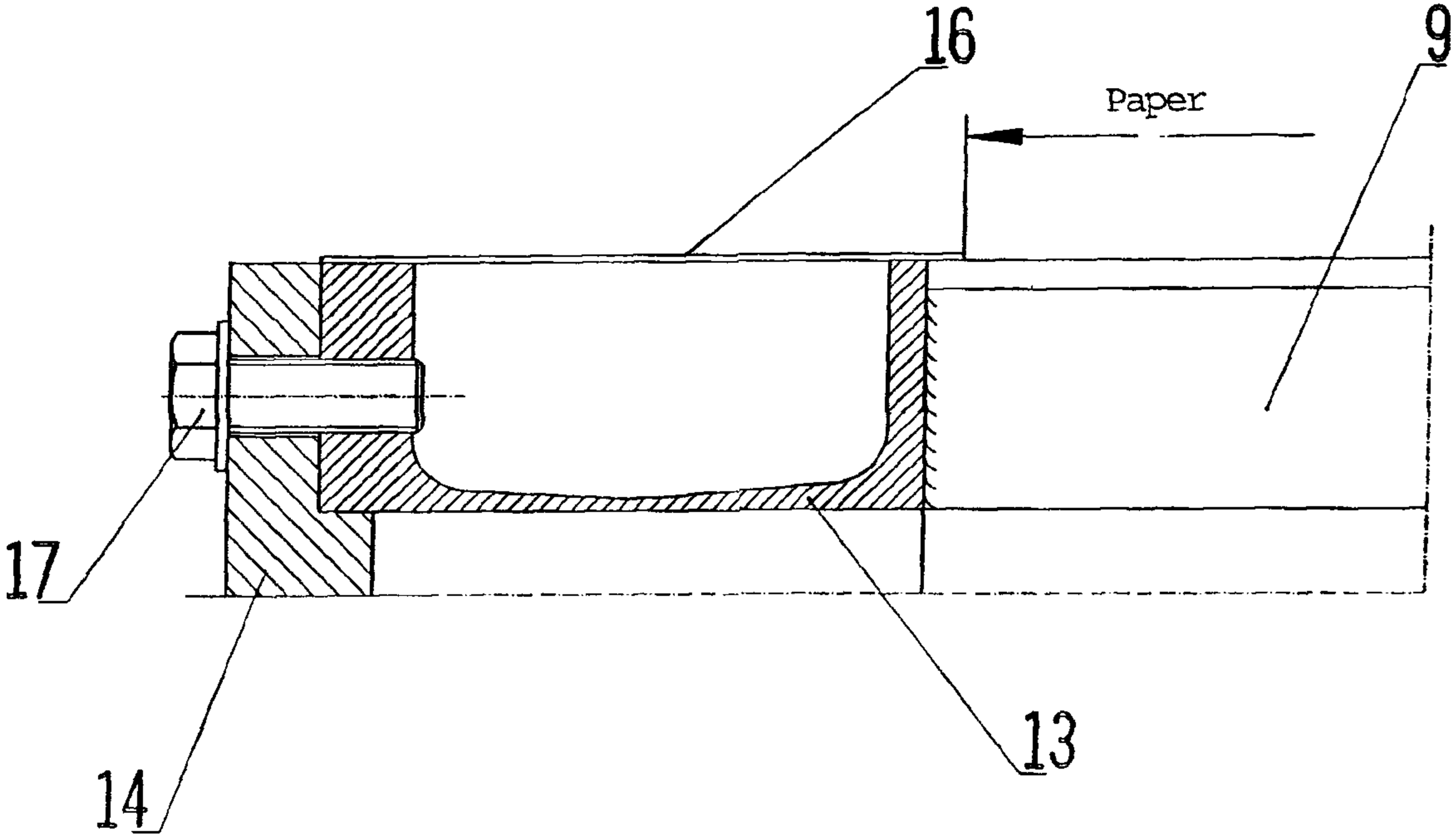


Fig. 6

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13