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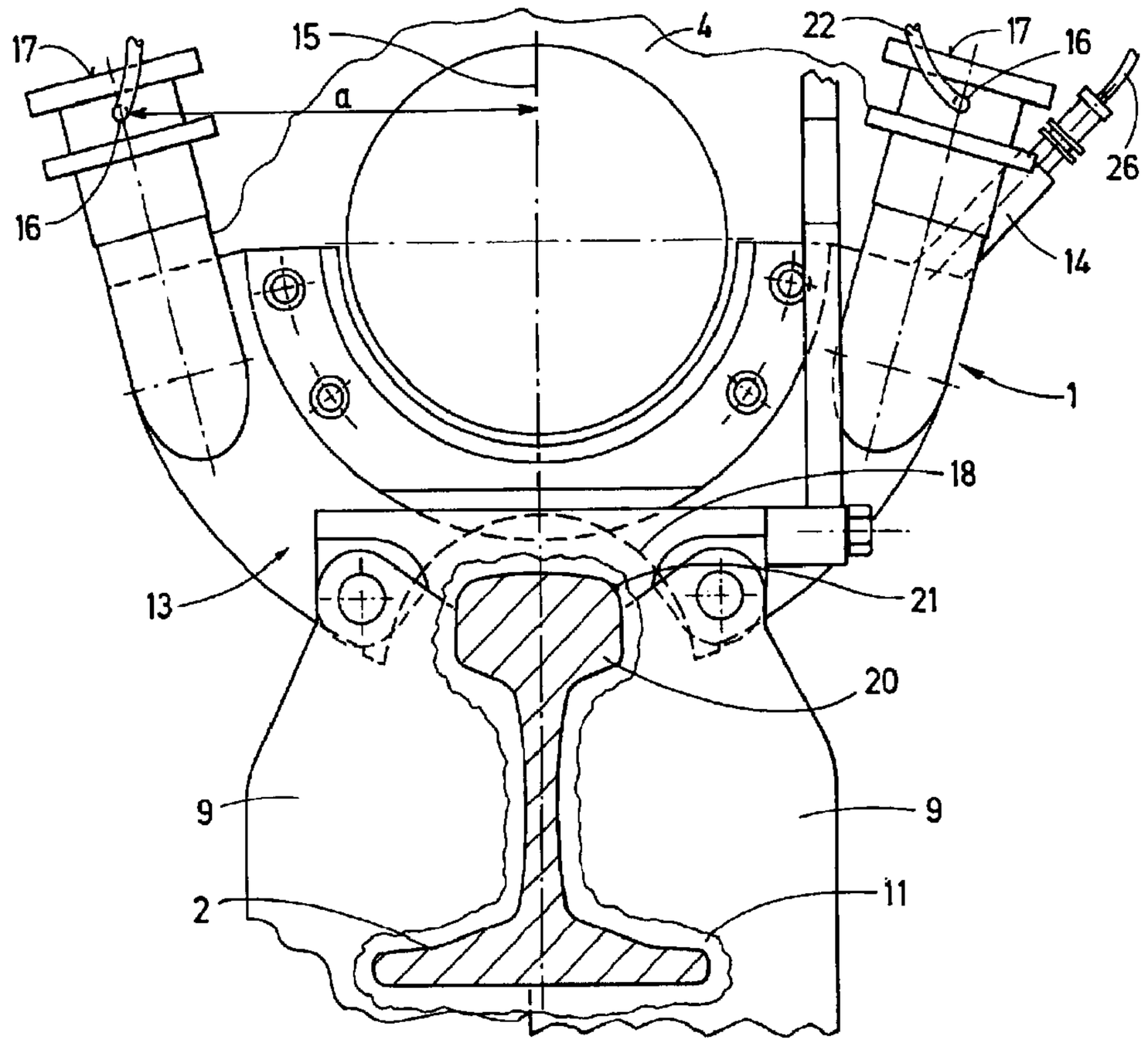
(54) Titre : GROUPE DE SOUDAGE POUR SOUDER DEUX RAILS D'UNE VOIE ET PROCEDE CORRESPONDANT
(54) Title: WELDING UNIT FOR WELDING TWO RAILS OF A TRACK AND CORRESPONDING METHOD



(57) Abrégé/Abstract:
A welding unit (1) for welding two rails (2) of a track comprises, on a unit half (4), an air nozzle (13) with a temperature sensor (14). Immediately after a welding burr (11) is sheared off, a glowing weld joint can be cooled in a controlled manner by supplying compressed air via a cooling opening (18) of the air nozzle (13). This makes it possible to carry out an optimal welding of head-hardened rails (2).

ABSTRACT

A welding unit (1) for welding together two rails (2) of a track comprises, on one unit half (4), an air nozzle (13) with a temperature sensor (14). Via a cooling opening (18) of the air nozzle (13), a glowing welded joint can be cooled in a controlled manner, immediately after shearing off a welding bead (11), by supplying compressed air. Thus, an optimal welding of head-hardened rails (2) can be accomplished.

(Fig. 3)

Welding unit for welding together two rails of a track, and method.

The invention relates to a welding unit according to the features cited in the introductory clause of claim 1, and a method.

Welding units of this type for so-called mobile flash-butt welding have already become known in various embodiments from a multitude of publications, such as, for example, US 3,349,216, EP 0 132 227 B1, or GB 2 185 703 A.

According to an article in the technical periodical "Rail Engineering International", Edition 2000, 3, pages 11 to 16, it is also known to cool the welded joint of head-hardened rails by supplying air. To that end, a special cooling hood comprising cooling openings is placed over the glowing welded joint after the welding device has been removed, and compressed air is supplied. The disadvantage of this manner of cooling lies in the fact that various essential procedures, such as the removal of the welding device, the amount of compressed air supplied, or the duration of the cooling process, depend upon the skill and reliability of the operating personnel.

It is the object of the present invention to provide a welding unit of the specified kind with which an optimal welding of head-hardened rails may be carried out.

According to the invention, this object is achieved with a welding unit of the type mentioned at the beginning by the features cited in the characterizing clause of claim 1.

An embodiment such as this makes it possible, immediately following the removal of the welding bead, to cool the welded joint in a controlled manner which is reproducible with equal quality at any time. In connection with the temperature sensor, the cooling operation can take place precisely within the most favorable temperature range, with the control unit providing the possibility to regulate the

supply of air in order to achieve a steady cooling process with optimal hardening of the rail head.
Additional advantages and features of the invention become apparent from the further claims and the drawing.

The invention will be described in more detail below with reference to an embodiment represented in the drawing in which

Fig. 1 shows a side view of a welding unit with a partially depicted welding machine,
Fig. 2 shows an enlarged side view of an air nozzle of the welding unit, and
Fig. 3 shows an enlarged view of the air nozzle in the longitudinal direction of the rails.

Visible in Fig. 1 is a mobile welding unit 1 designed for carrying out electrical flash-butt weldings of rails 2 of a track 3. The welding unit 1, which may be supplied with energy from a welding machine 23, consists of two unit halves 4 and a control device 5. The two unit halves 4 are connected to one another, and adjustable relative to one another, by way of hydraulic compression cylinders 7 extending in a longitudinal direction 6 of the rails.

Each unit half 4 comprises a pair of clamping jaws 8 - lying opposite one another perpendicularly to the longitudinal direction of the rails - which, for carrying out the welding operation, may be pressed onto the rails 2. Provided between the two unit halves 4 is a shearing knife 9 which is displaceable in the longitudinal direction of the rails - relative to the two unit halves 4 - by means of a drive 10 for the purpose of shearing a welding bead 11 from a welded joint 12 (Fig. 2).

As can be seen in more detail further in Fig. 2 and 3, an air nozzle 13 including a temperature sensor 14 is fastened directly to the shearing knife 9. The control device 5 is configured for supplying compressed air to the air nozzle 13 within a selectable temperature range relating to the temperature of the welded joint 12. Associated with the air nozzle 13 are two compressed air openings 16 and two

suction ports 17, arranged in each case, in a transverse direction extending perpendicularly to the longitudinal direction 6 of the rails, at an equal distance a from a plane of symmetry 15 of the rail. The compressed air opening 16 is arranged in each case underneath the suction port 17, with a cross-section of the suction port 17 being larger, by at least a factor of three, than a cross-section of the compressed air opening 16.

The temperature sensor 14 is designed as an infrared pyrometer for contact-less measurement of the temperature of a measuring point 21, positioned on a rail head 20, of the welded joint 12. Connected to the compressed air opening 16 is a compressed air line 22 which is coupled to an air compressor installation 24 located in the welding machine 23. The air compressor installation 24 contains a valve 25, actuatable by the control device 5, for controlling the supply of compressed air.

The control device 5 is configured for inputting a starting temperature and a stopping temperature, at which temperature the air supply via the compressed air lines 22 is automatically started or stopped. To that end, the temperature sensor 14 is connected to the control device 5 via a conduit 26. Additionally, the control device 5 is equipped with a storage means 19 for registering and recording the parameters: starting temperature and cooling temperature, duration of supplying compressed air, and temperature curve during the cooling phase.

The mode of function of the welding unit will now be described in more detail.

For executing a weld, the welding unit 1 is lowered from the welding machine 23 onto the two rails 2 to be connected to one another, and is engaged to the same by means of the clamping jaws 8. While electrical current is supplied, a glowing welded joint 12 and a welding bead 11 is produced in the known manner. The latter is sheared off instantly from the welded joint 12 by moving the shearing knife 9, by means of the drive 10, in the longitudinal direction 6 of the rails relative to the two unit halves 4 which remain in contact with the rails. In the process, the sheared-off welding bead 11 is distanced from the glowing welded joint 12 (see Fig. 2), and the

air nozzle 13 mounted on the rear side of the shearing knife 9 is automatically positioned so that its cooling opening 18 lies exactly above the welded joint 12.

After the temperature sensor 14 detects the ideal starting temperature for the cooling phase, the valve 25 is opened with the aid of the control device 5, causing a supply of dried compressed air (6 bar pressure, 1,400 liters/minute) to be fed in a controlled way to the air nozzle 13 via the compressed air lines 22. As a result, ambient air is sucked into the two suction ports 17 (25,000 liters/minute) and fed via the cooling opening 18 to the welded joint 12 in the region of the rail head 20 for the cooling thereof. As soon as the temperature sensor 14 registers a critical cooling temperature at the measuring point 21, the supply of compressed air is interrupted and the cooling phase is terminated. Thus, a hardening of the welded joint 12 in the region of the rail head 20 to a depth of 15 millimeters has been achieved. Finally, the clamping jaws 8 and the shearing knife 9 are detached from the rail 2, and the welding unit 1 is raised for travelling on to the next welding site.

The starting temperature for initiating the controlled cooling process ought to lie within a range of 800° to 850° C. The critical temperature for terminating the cooling phase should be around 500° C. In this context, it should be particularly borne in mind that the latest point in time for initiating the cooling of the welded joint 12 is thirty seconds after finishing the welding. Since these cooling parameters naturally depend upon the kind of rails being welded or the specifications prescribed by the rail manufacturer, it is especially advantageous if various cooling parameters, optimally adapted in each case to a specific type of rail, are stored in the control device 5 and may be called up with the push of a button.

The parameters: starting temperature and cooling temperature, duration of supplying compressed air, and temperature curve are registered and recorded during every cooling operation of a welded joint 12. The amount of compressed air fed to the cooling opening 18 via the air nozzle 13 is regulated automatically in such a way that the cooling of the welded joint 12 progresses at a steady rate (for example 4° C per second). The control device 5 allows the welding process to start only when enough compressed air is present in the air compressor installation 24.

Claims

1. A welding unit (1) for welding together two rails (2) of a track (3), consisting of a control device (5) and two unit halves (4), movable in the longitudinal direction (6) of the rails by means of compression cylinders (7) and each comprising clamping jaws (8) provided for application to the rails (2), and a shearing knife (9) for shearing off a welding bead (11) from a welded joint (12), **characterized in that** an air nozzle (13) having a temperature sensor (14) is mounted on one unit half (4), and the control device (5) is provided for supplying compressed air to the air nozzle (13).

2. A welding unit according to claim 1, characterized in that the air nozzle (13) and the temperature sensor (14) are arranged between the two unit halves (4).

3. A welding unit according to one of claims 1 or 2, characterized in that the air nozzle (13) is mounted to the shearing knife (9).

4. A welding unit according to claim 1, characterized in that the control device (5) is configured for inputting a starting temperature for automatically starting the supply of air in dependence upon a temperature of the welded joint (12) detectable by the temperature sensor (14).

5. A welding unit according to claim 1 or 4, characterized in that the control device (5) is configured for inputting a stopping temperature for automatically stopping the supply of air in dependence upon a temperature of the welded joint (12) detectable by the temperature sensor (14).

6. A welding unit according to one of claims 1, 2 or 3, characterized in that the supply of compressed air to the air nozzle (13) may be controlled by the control device (5) in dependence upon the temperature of the welded joint (12) detectable by the temperature sensor (14).

7. A welding unit according to one of claims 1 to 6, characterized in that the air nozzle (13) comprises a cooling opening (18) positionable immediately above a rail head (20) of the welded joint (12), a compressed air opening (16) connected to a compressed air line (22), and a suction port (17) for the intake of ambient air.

8. A welding unit according to claim 7, characterized in that associated with the air nozzle (13) are two compressed air openings (16) and two suction ports (17) which are arranged in each case, in a transverse direction extending perpendicularly to the longitudinal direction (6) of the rails, at an equal distance a from a plane of symmetry (15) of the rail.

9. A welding unit according to claim 7 or 8, characterized in that the compressed air opening (16) is arranged underneath the suction port (17), with a cross-section of the suction port (17) being larger, by at least a factor of three, than a cross-section of the compressed air opening (16).

10. A welding unit according to claim 1, characterized in that the temperature sensor (14) is designed as an infrared pyrometer configured for non-contact measuring of the temperature of a measuring point (21), positioned on the rail head (20), of the welded joint (12).

11. A method of welding together rails of a track, wherein two rails (2) are heated during regulated supply of current and subsequently are pressed against one another with high pressure, forming a welded joint (12) and a welding bead (11), **characterized by the following features**:

a) immediately after removal of the welding bead (11) from the welded joint (12), an air nozzle (13) having a cooling opening (18) comes to lie above the glowing welded joint (12),

b) the temperature of the welded joint (12) is measured,

c) upon the welded joint (12) reaching a critical starting temperature, compressed air and ambient air aspirated as a result of the compressed air streaming into the air nozzle (13) are automatically supplied to the air nozzle (13),

d) the supply of compressed air is automatically stopped upon the welded joint (12) reaching a critical cooling temperature,

e) the welding unit (1) is lifted from the welded rails (2).

12. A method according to claim 11, characterized in that the parameters: starting and cooling temperature, duration of supplying compressed air, and temperature curve are registered and recorded during the cooling phase.

13. A method according to claim 11 or 12, characterized in that the amount of compressed air supplied to the cooling opening (18) via the air nozzle (13) is controlled in such a manner that the welded joint (12) is cooled at a steady rate (°Celsius/second).

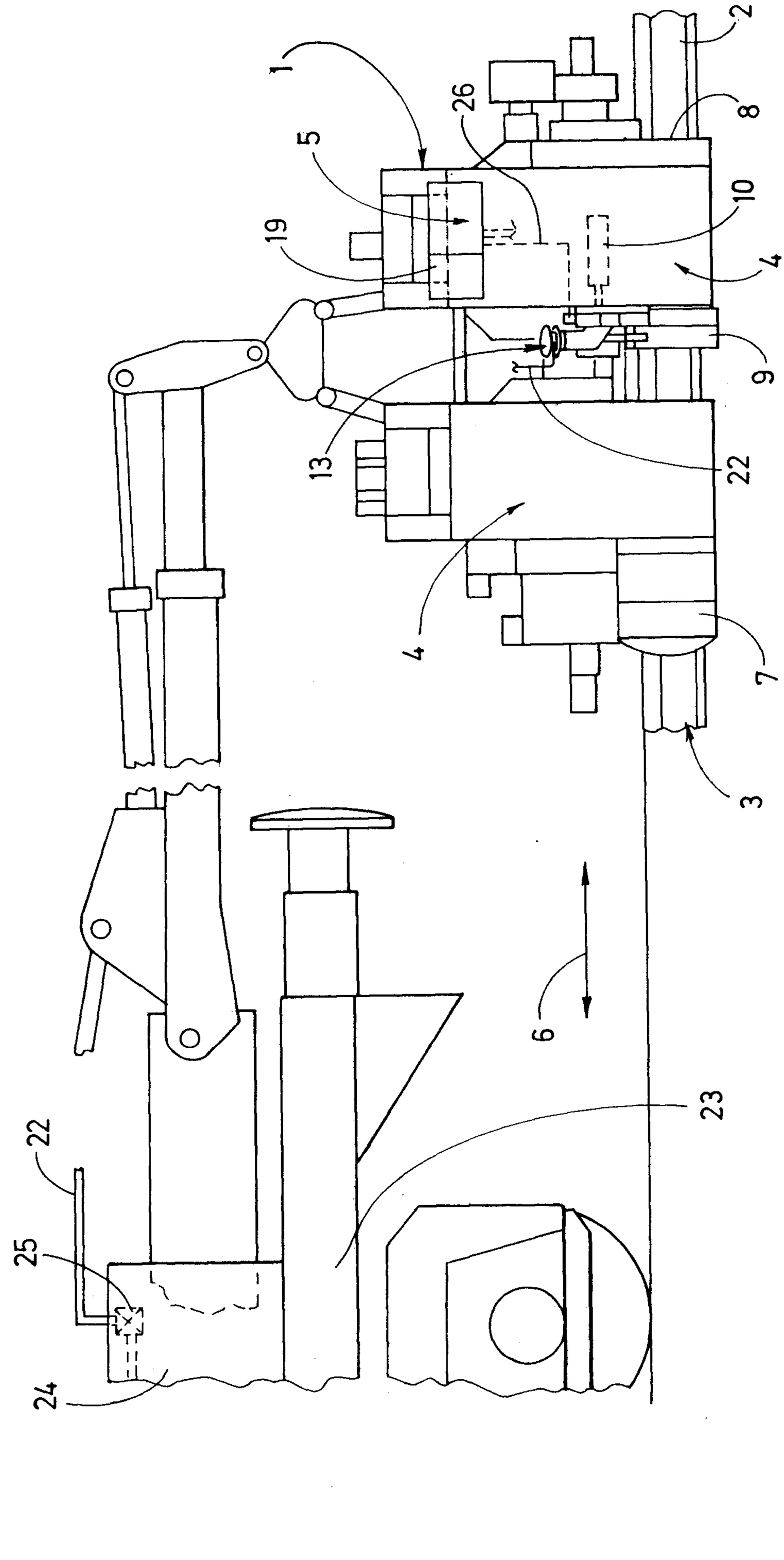


Fig. 1

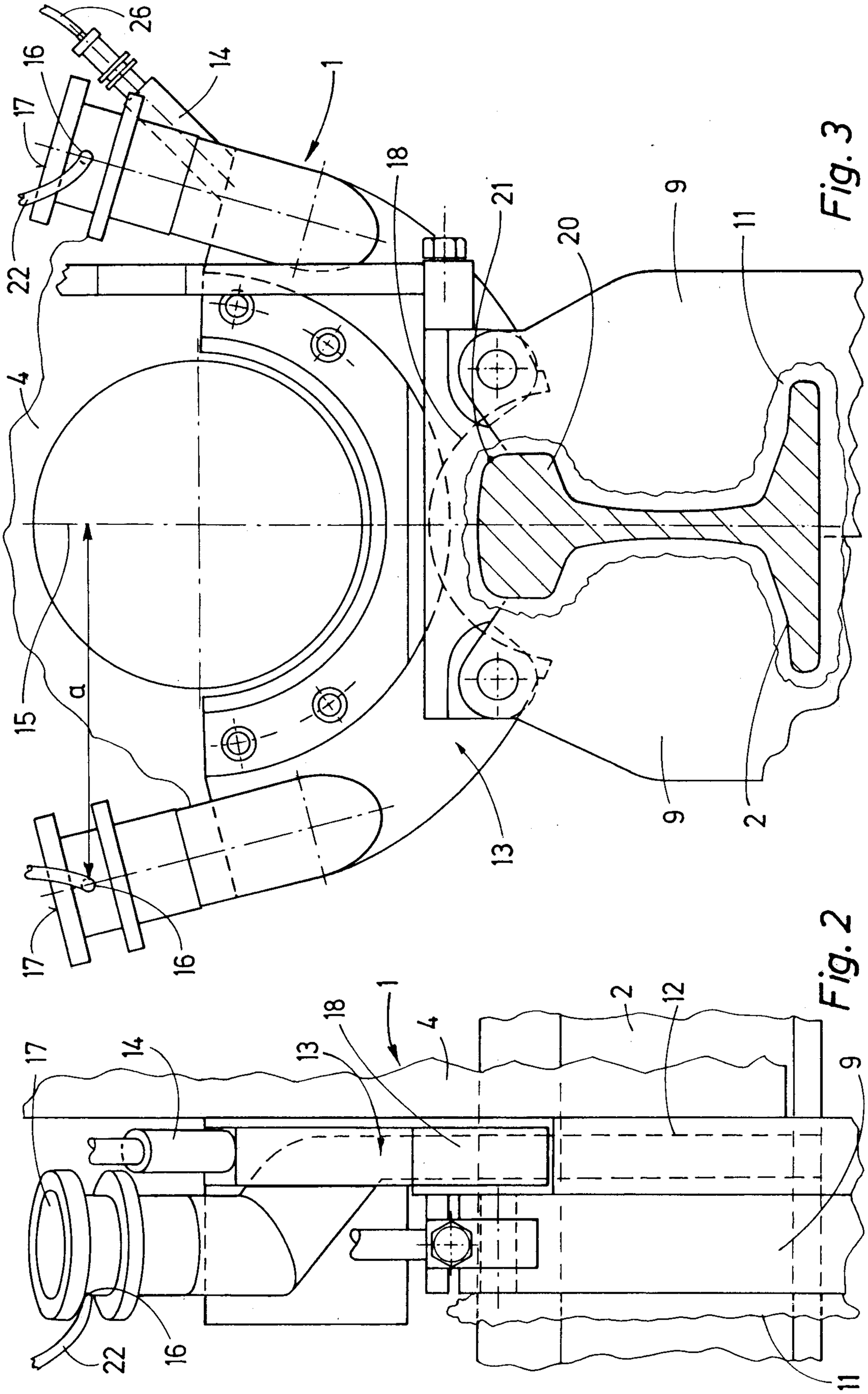

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Fig. 3

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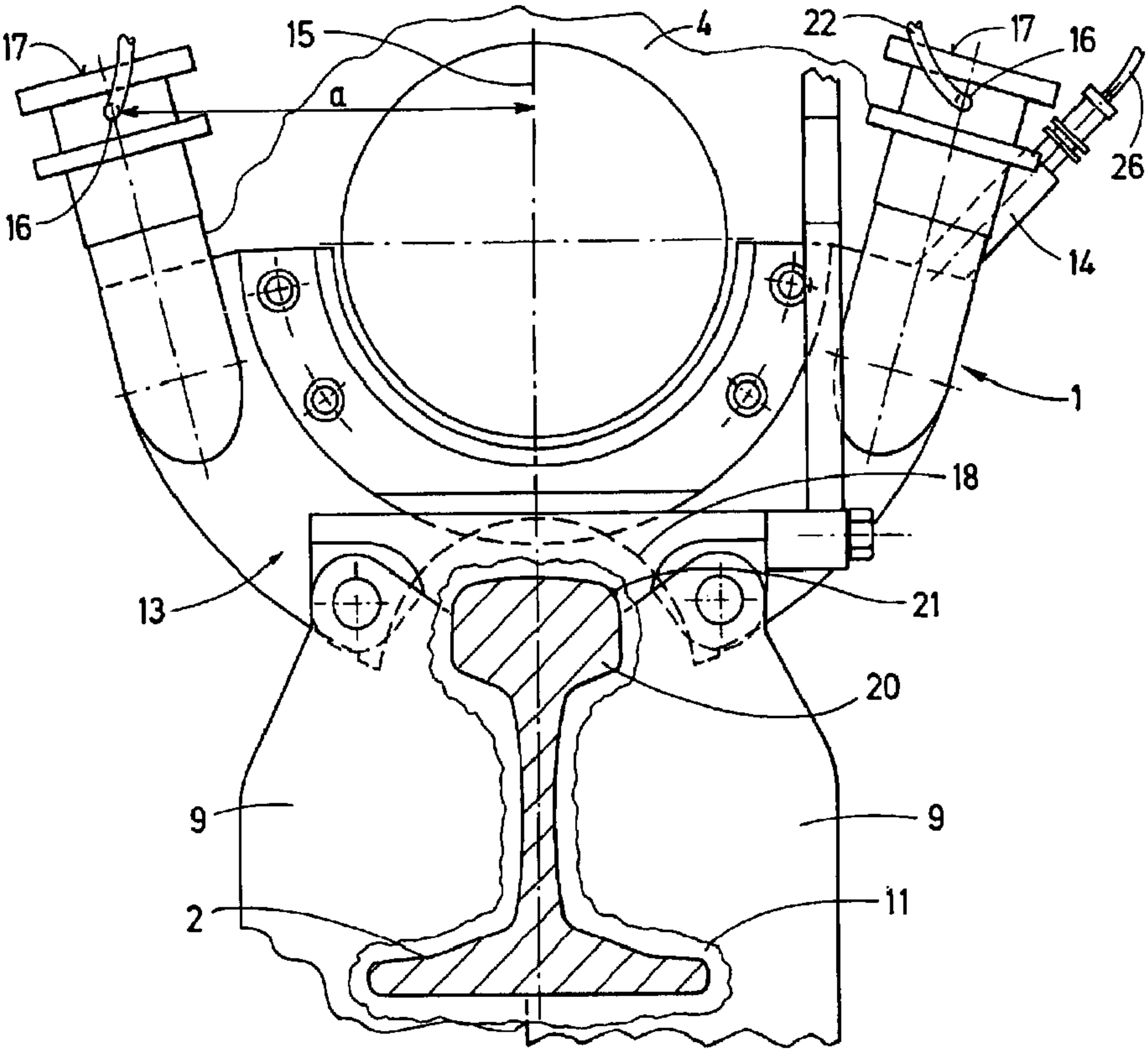
Fig. 2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