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(54) **SELF-ADJUSTING JET BREAKER FOR IMPACT SPRINKLERS.**

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Description

The present invention relates to a self-adjusting jet breaker device for impact sprinklers.

The breaker device according to the invention can be mounted on impact sprinklers of the type described, for example, in the Italian patent application No 85608 A/90 in the name of this same Applicant Such sprinklers generally comprise a spout which is connected to a supply line by means of a braked rotary coupling, with a terminal nozzle for generating a jet and an oscillating arm provided with a baffle which periodically interferes with the jet.

In said sprinklers, the baffle, during its interference with the jet, captures part of the kinetic energy of said jet, imparting to the arm an instantaneous rotary torque which tends to cause both the oscillation of the arm and the rotation of the spout in steps of preset breadth. The baffle furthermore has the function of periodically breaking the fluid column so as to distribute the water proximate to the sprinkler as well.

However, when the pressure of the jet is low, its breakup is limited due to the slow rate at which said jet interacts with the baffle. If one wishes to increase the oscillation frequency of the arm even with low jet supply pressures, this cannot be achieved by means of conventional fixed-geometry baffles but by modifying, within certain limits, the balance of the arm or possibly the rigidity of resilient members.

DE-C-975525 dicloses an impact sprinkler having an adjustable baffler connected to the rotation apparatus of the sprinkler. This sprinkler allows for a greater range of adjustment at the cost, however, of a greater complexity in construction and operation.

The aim of the present invention is to provide a jet breaker device which allows to significantly increase the beat frequency for an equal jet pressure.

An object of the present invention is to provide a self - adjusting jet breaker device which is able to improve the breakup of the jet especially at low pressures, leaving its maximum range substantially unchanged.

Another object of the present invention is to provide a jet breaker device which can interact with the jet in one or both of the rotation directions of the sprinkler.

Not least object of the present invention is to provide a jet breaker device which has an extremely simple and economical structure.

This aim, these objects and others which will become apparent hereinafter are achieved by a jet breaker device of the above described type, having the characteristics of the independent claim 1.

A jet breaker device of this type can be applied to existing impact sprinklers so as to significantly increase the beat frequency and intensify the breakup of the jet in one or both of the directions in which the sprinkler rotates about its own vertical axis.

Further characteristics and advantages will become apparent from the detailed description of some preferred but not exclusive embodiments of the self-adjusting jet breaker device according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a general perspective view of a jet breaker device according to the invention, installed on a per se known impact sprinkler;

Figure 2 is a top view of the arrangement of Figure 1;

Figure 3 is an enlarged perspective view of the jet breaker device of Figures 1 and 2;

Figure 4 is a diagram of the operation of the device of Figure 3;

Figure 5 is a perspective view of a second embodiment of the device according to the invention;

Figure 6 is a view of the device of Figure 5 in a different operating condition;

Figures 7 and 8 are schematic views of the operation of the device shown in Figures 5 and 6.

A jet breaker device according to the invention, generally designated by the reference numeral 200, is mounted on an impact sprinkler designated by the letter I. The sprinkler comprises a spout T which has a braked coupling R at one end. Coupling R can rotate about a vertical axis, and is adapted to connect the spout to a pressurized water supply line L. Coupling R is also rigidly associated with a frame, which is not shown in the drawings.

A nozzle U for generating a jet G is arranged at the free end of the spout T, while an oscillating arm B is pivoted proximate to its central portion. A baffle D is arranged at the outer end of the arm and is used to periodically and impulsively capture part of the energy of the jet in order to make the arm oscillate about its fulcrum and thereby rotate the spout about its own vertical axis. It is evident that the device according to the invention can be equally installed on sprinklers of a different type, provided that they have the same general characteristics.

The jet breaker device 200 comprises one or more active surfaces which can be anchored to the arm B, for example, in an intermediate position between its oscillation axis and the baffle, so as to interact at least once with the jet between two successive oscillations of the arm. Alternatively, the

device 200 might also be mounted at a greater distance from the baffle, achieving the same final result.

In the first embodiment, shown in detail in Figure 3, the device 200 comprises a pedestal 201 which is anchored to the arm B, by means of a fixing plate 202, on one side with respect to its centerline M. A bracket support 203 is fixed at the top of the pedestal 201 and is provided with a grooved guide 204. Guide 204 slidingly accommodates a blade 206 provided with a sharp edge 207 and with an elongated fixing hole 208. The active surface of the device, which is intended to interfere with the jet, is constituted by the lower face of the blade 206. Blade 206 is fixed in position along the guide 204 of the support 203 by means of a bolt 209 which passes through the elongated hole 208. It is thus possible to arrange the device 200 on one side or on both sides with respect to the longitudinal axis of the arm B, so that the blade interferes with the jet during the rotation of the sprinkler in one direction or in both directions.

As can be seen in Figure 4, the bracket support 204 is inclined with respect to the axis of the pedestal 201, so that the blade 206 forms an angle τ with the longitudinal axis M of the arm B. The height of the pedestal 201 and the shape of the bracket support 204 are also such that the blade is at a minimum distance H from the longitudinal axis of the arm.

Thus, after the arm has started its downward oscillation starting from its upper stroke limit, the jet G initially interacts with the baffle D, causing the arm B to rotate downward without encountering the jet breaker device. At a certain point, the blade 206 of the jet breaker 200 will begin to skim the jet G, being approximately parallel to the axis thereof, as indicated by the position 206' shown in broken lines in Figure 4. In this position, a substantially nil perpendicular force acts on the blade, while the positive sharpening angle of the leading edge of the blade facilitates its penetration in the jet.

As the arm moves downward, the negative incidence of the blade 206 with respect to the jet gradually increases. Thus, in this step part of the jet is progressively deflected downward, giving said jet a peculiar fan shape. The reaction F which acts at right angles and upward on the blade also increases correspondingly, generating a braking torque on the arm, i.e. a torque which tends to dampen the downward oscillation and to cause the early reversal of the direction of rotation of the arm, which coincides with its lower stroke limit. The braking torque will be maximum in the lower position, designated by 206'' in Figure 4, which coincides with the position in which the blade enters the jet during the upward movement of the arm. Thus, in its upward movement, the blade 206 interacts with the jet G, exerting an accelerating torque on the arm, i.e. a torque which tends to facilitate its upward movement. This acceleration in ascent, combined with braking during descent, determines an overall increase in the beat frequency of the arm, and thus in the rotation rate of the sprinkler. Naturally, once the jet has abandoned the region of interference with the breaker and with the baffle, it can resume its shape, achieving its maximum range. At high pressure, the blade transit speed is such as to cause a sudden and effective breakup of the jet both during its downward movement and during its upward movement.

Experimental tests have shown that blade inclination angles τ comprised between 15° and 30°, and preferably equal to approximately 25°, give the best results in varying the frequency and breakup of the jet. The distance H can vary according to the size of the baffle D and according to the distance from the arm oscillation axis.

The second embodiment of the jet breaker, shown in Figures 5 and 6, where in the corresponding elements have been designated by the same reference numerals, differs from the first one in that it has a pair of active surfaces having different inclinations, instead of a single surface. In particular, the active surfaces are constituted by the lower faces of two deflector wings 210, 211 which extend radially and on opposite sides of a ratchet 212. Ratchet 212 is mounted on the adjustable-length pedestal 201 so as to be able to rotate vertically. The wings 210 and 211 have a convex shape, similar to a wing contour, with a median axis which forms respective angles Φ_1 and Φ_2 with respect to the longitudinal axis of the arm.

By means of a snap-locking device, the ratchet 212 can be rotated manually and retained in two diametrically opposite fixed positions, so as to expose only one of the wings 210 and 211 to the jet, as clearly shown in Figures 5 and 6.

Figures 7 and 8 schematically illustrate the fact that operatively the angle Φ_1 is such that the median axis of the wing 210 is approximately parallel to the direction of the jet during transit through said jet. Therefore, the wing 210 is used mainly to break up the jet without transmitting appreciable forces to the arm during its oscillation. On the contrary, the angle Φ_2 of the wing 211 is such that the jet is always inclined with respect to the wing 211 during its interference. This will cause, on the lower surface of the wing 211, a thrust with a perpendicular component F directed upward, which applies a clockwise torque to the arm, with an effect similar to the one described for the model of Figure 3.

The above description and experimental tests show that the jet breaker device according to the invention achieves the intended aim and objects

and in particular it is noted that it produces an optimum distribution and breakup of the jet together with an increase in the beat frequency in an automatic manner, i.e. adapting to both high and low jet supply pressures. The device according to the invention is also simple and economical to manufacture and easy to install on existing sprinklers with no modification of their structure.

The device thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept expressed in the accompanying claims.

Claims

1. Impact sprinkler with a self-adjusting jet breaker device (200), comprising a water spout (T) with a nozzle (U) for generating a jet (G) and an oscillating arm (B) provided with a baffle (D), said breaker device being arranged on said arm at a selected distance between said baffle (D) and the oscillation axis of said arm and comprising at least one first active surface (206, 210, 211), said surface being adapted to interact with said jet between two successive oscillations of said arm, characterized in that said active surface has such an angle (τ) of inclination with respect to the longitudinal axis (M) of said arm (B) that it is substantially tangent to the jet at the beginning of its downward transit through said jet from above.

2. Impact sprinkler according to claim 1, characterized in that said active surface is progressively inclined with respect to the axis of the jet during transit through said jet, so as to receive an upward thrust.

3. Impact sprinkler according to claim 1, characterized in that said active surface is constituted by the lower face of a substantially planar blade (206) which is fixed to the top of a pedestal (201) which is anchored to said arm by means of a fixing plate.

4. Impact sprinkler according to claim 1, characterized in that the average inclination angle (τ) of said blade with respect to the longitudinal axis of said arm is comprised between 15° and 30°.

5. Impact sprinkler according to claim 4, characterized in that said blade (206) can move along a guiding groove (204) defined in a bracket support (203), said blade having an elongated central hole (208) for anchoring in said guide of said bracket support in lateral terminal positions.

6. Impact sprinkler according to claim 4, characterized in that it has a second active surface (211) mounted at the top of said support in a position which is diametrically opposite and with a different inclination angle (Φ_2) with respect to the first active surface (210).

7. Impact sprinkler according to claim 6, characterized in that said first active surface (210) and said second active surface (211) extend radially from a ratchet (212) which is mounted so as to be able to rotate at the top of said pedestal and can be arranged in two diametrically opposite fixed angular positions.

8. Impact sprinkler according to claim 4, characterized in that said angle (τ) is approximately 25°.

Patentansprüche

1. Impulsregner mit einer selbsteinstellenden Strahlunterbrechungseinrichtung (200), enthaltend ein Wasserspritzrohr (T) mit einer Düse (U) zur Erzeugung eines Strahles (G) sowie einen mit einem Prallblech (D) ausgestatteten Schwingarm (B), wobei die Unterbrechungseinrichtung auf dem Arm in einem ausgewählten Abstand zwischen dem Prallblech (D) und der Schwingachse des Armes angeordnet ist und mindestens eine erste aktive Fläche (206,210,211) aufweist, die geeignet ist, mit dem Strahl zwischen zwei aufeinanderfolgenden Schwingungen des Arms in Wechselwirkung zu treten, dadurch gekennzeichnet, daß die aktive Fläche einen solchen Neigungswinkel (τ) zur Längsachse (M) des Arms (B) hat, daß sie zu Beginn ihres von oben nach unten gerichteten Durchgangs durch den Strahl im wesentlichen tangential zu demselben verläuft.

2. Impulsregner nach Anspruch 1, dadurch gekennzeichnet, daß die aktive Fläche während des Durchgangs durch den Strahl in bezug auf die Strahlachse zunchmend geneigt ist, um eine aufwärts gerichtete Schubkraft zu erhalten.

3. Impulsregner nach Anspruch 1, dadurch gekennzeichnet, daß die aktive Fläche durch die Unterseite eines im wasentlichen ebenen Flügels (206) gebildet wird, welcher an der Oberseite eines Ständers (201) befestigt ist, der seinerseits mittels einer Befestigungsplatte auf dem Arm verankert ist.

4. Impulsregner nach Anspruch 1, dadurch gekennzeichnet, daß der durchschnittliche Nei-

gungswinkel (τ) des Flügels in bezug auf die Längsachse des Arms zwischen 15° und 30° liegt.

5. Impulsregner nach Anspruch 4, dadurch gekennzeichnet, daß der Flügel (206) in einer in einem Haltearm (203) angebrachten Führungsrille (204) bewegt werden kann und ein Langloch (208) zur Verankerung in der Führung des Haltearms in seitlichen Endlagen aufweist.

6. Impulsregner nach Anspruch 4, dadurch gekennzeichnet, daß er eine zweite aktive Fläche (211) aufweist, die an der Oberseite des Haltearms in einer Stellung montiert ist, die in bezug auf die erste aktive Fläche (210) diametral entgegengesetzt und mit einem anderen Neigungswinkel (Φ_2) angeordnet ist.

7. Impulsregner nach Anspruch 6, dadurch gekennzeichnet, daß die erste aktive Fläche (210) und die zweite aktive Fläche (211) radial von einem Klinkenrad (212) abstehen, das drehbar an der Oberseite des Ständers angebracht ist und in zwei einander diametral gegenüberliegenden, festen Winkelstellungen angeorndet werden kann.

8. Impulsregner nach Anspruch 4, dadurch gekennzeichnet, daß der Winkel (τ) etwa 25° beträgt.

Revendications

1. Tête d'arrosage à impact d'un dispositif brise-jet auto-réglable (200) comportant un bec (T) pourvu d'une buse (U) pour engendrer un jet (G), et un bras oscillant (B) équipé d'un écran (D), ledit dispositif de rupture étant disposé sur ledit bras à une distance choisie entre ledit écran (D) et l'axe d'oscillation dudit bras et comportant au moins une première face active (206, 210, 211), propre à coopérer avec ledit jet entre deux oscillations successives dudit bras, caractérisée en ce que ladite face active présente un angle d'inclinaison (τ) par rapport à l'axe longitudinal (M) dudit bras (B) qui est substantiellement tangent au jet au début de sa descente en traversant ledit jet à partir du haut.

2. Tête d'arrosage à impact selon la revendication 1, caracterisée en ce que ladite face active est progressivement inclinée par rapport à l'axe du jet pendant son transit à travers ledit jet, de manière à recevoir une poussée vers le haut.

3. Tête d'arrosage à impact selon la revendication 1, caractérisée en ce que ladite face active est constituée par la paroi inférieure d'une lame (206) substantiellement plane, qui est fixée au sommet d'un pied (201) solidaire du bras au moyen d'une plaque de fixation.

4. Tête d'arrosage à impact selon la revendication 1, caracterisée en ce que l'angle moyen d'inclinaison (τ) de ladite lame par rapport à l'axe longitudinal dudit bras est compris entre 15° et 30°.

5. Tête d'arrosage à impact selon la revendication 4, caracterisée en ce que la lame (206) peut se déplacer le long d'une rainure de guidage (204) définie dans un support (203), ladite lame ayant un trou central oblong (208) pour son ancrage dans ledit guide du support dans des positions latérales déterminées.

6. Tête d'arrosage à impact selon la revendication 4, caractérisée en ce qu'elle possédé une seconde face active (211) montée au sommet du support dans une position qui est diamétralement opposée et avec un angle d'inclinaison différent (ϕ_2) par rapport à la première face active (210).

7. Tête d'arrosage a impact selon la revendication 6, caractérisée en ce que ladite première face active (210) et ladite seconde face active (211) s'étendent radialement à partire d'un cliquet (212) qui est monte de manière a pouvoir tourner au sommet dudit pied et qui peut être dispose en deux positions angulaires fixes diamétralement opposées.

8. Tête d'arrosage à impact selon la revendication 4, caractérisée en ce que ledit angle (τ) est approximativement de 25°.

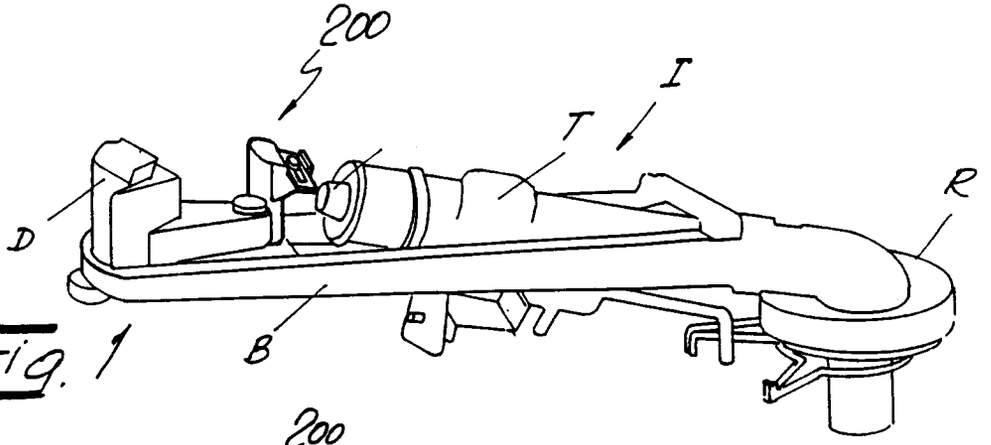

Fig. 1

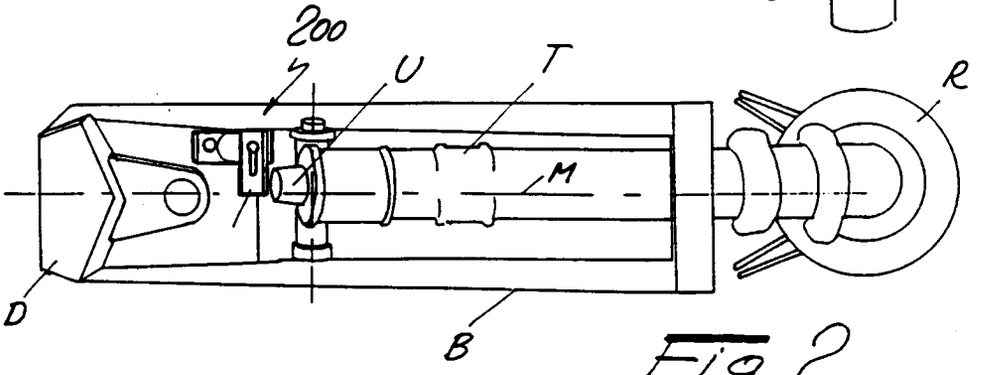

Fig. 2

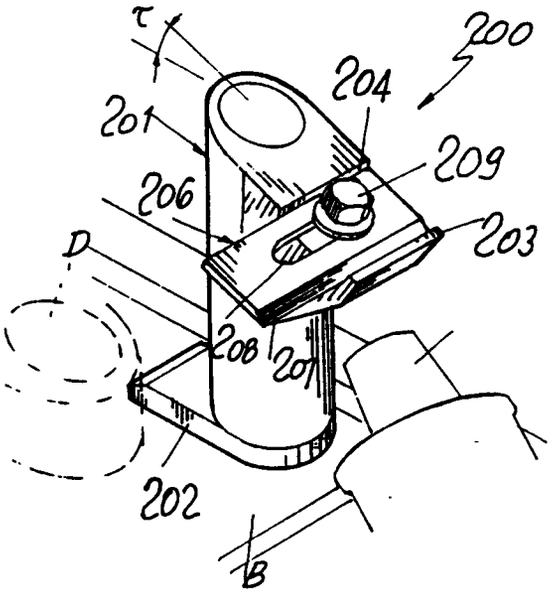

Fig. 3

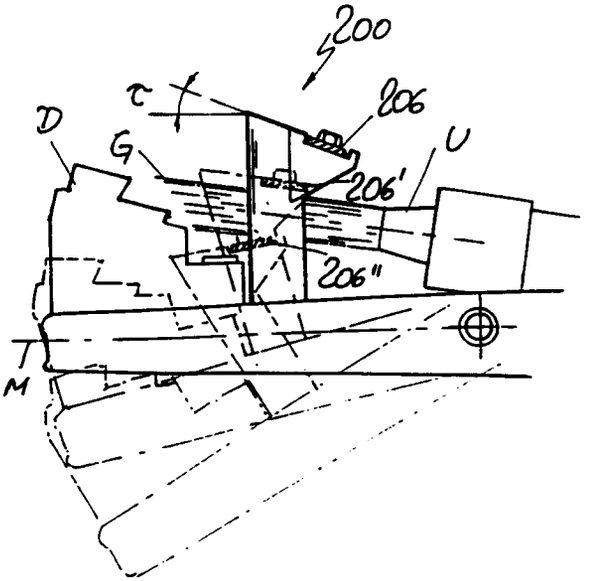

Fig. 4

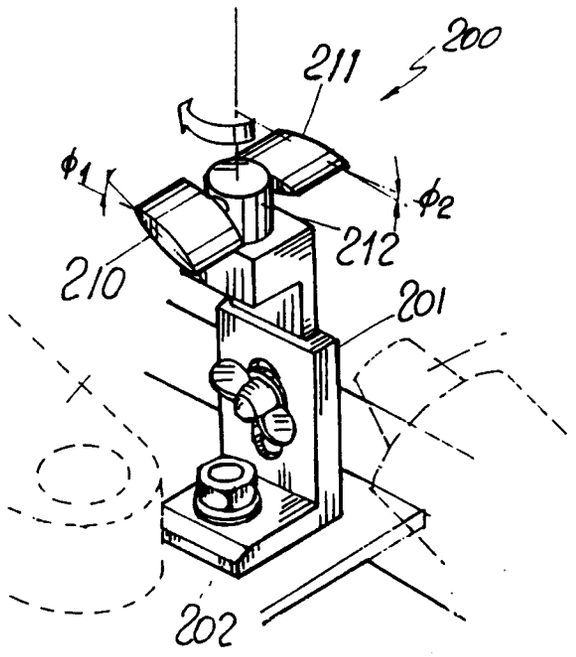

Fig. 5

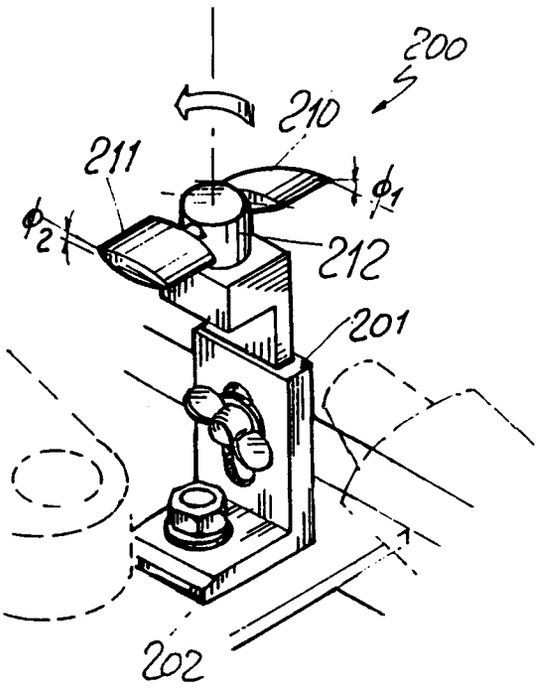

Fig. 6

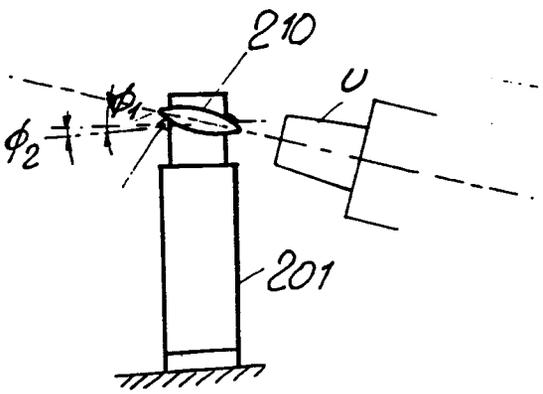

Fig. 7

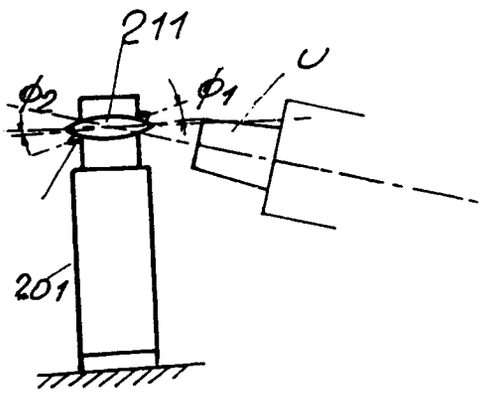

Fig. 8