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(54) **MAINS ELECTRICAL OUTLET**

ELEKTRISCHE NETZSTECKDOSE

SORTIE SECTEUR

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Description

[0001] The present invention relates to a mains electrical outlet and more particularly to such an outlet provided with manual switching facilities.

[0002] Mains electrical outlets are housed in standard size boxes and are usually either one-gang or two-gang. Attempts have been made in the past to provide switched electrical outlets with fault protection in the form of residual current devices but all previous attempts have either resulted in the need for nonstandard sized outlets or else the use of a two-gang box for a one-gang RCD protected outlet. GB-A-2169749 on which the preamble of claim 1 is based discloses such a mains electrical outlet incorporating automatic circuit protection and has contacts which are opened by fault detection provisions. The contacts are normally operated by a conventional rocker switch but if automatically opened as a result of a fault condition need to be reset by a separate push button. There is thus a need for a switched electrical outlet which has RCD protection but which will fit in a standard size housing.

[0003] The present invention proposes to provide a switched mains electrical outlet comprising:

first contacts;

second contacts mounted on a contact carrier means arranged to be moveable to allow the second contacts to close with the first contacts;

manually operable switching means; and

fault detection means arranged to control the mode of operation to automatically open the first and second contacts in the presence of a fault;

characterised in that the contact carrier means is arranged to rotate about an axis to allow closure of the first and second contacts and the manually operable switching means is arranged to rotate about said axis, and in that there are linkage means between the contact carrier means and the manually operable switching means capable of adopting one of two modes of operation in response to the fault detection means, wherein

in the first mode of operation the linkage means causes the contact carrier means to axially engage the manually operable switching means thereby preventing relative rotation therebetween whereby to allow the first and second contacts to be switched closed; and wherein

in the second mode of operation the linkage means causes the contact carrier means to axially disengage from the manually operable switching means thereby allowing relative rotation therebetween whereby to permit the first and second contacts to open or to remain open in the presence of a fault.

[0004] A preferred embodiment utilises the normal electrical contact assembly for making and breaking the

power contacts together with a normal construction of manually operable switching means. However, the linkage between these two elements is a controllable coupling operating in response to a fault detection mechanism. In the preferred embodiment, the controllable coupling is in the form of an axial clutch which is capable of axial movement in the presence of a fault condition to thereby effectively disengage the mains contacts from the manually operable switch member to permit the mains contacts to open but when there is no fault condition the mains contact operating mechanism is locked to the operation of the manually operable switch member.

[0005] In order that the present invention be more readily understood, an embodiment thereof will now be described with reference to the accompanying drawings in which:

Figure 1 shows a diagrammatic representation of the overall assembly;

Figure 2 shows a sketch of a manually operable member used with the assembly shown in Fig. 1; and

Figure 3 shows an exploded perspective view of a part of the assembly shown in Figure 1.

[0006] The preferred embodiment of the present invention is designed to result in a switched electrical outlet which has RCD protection built in but which occupies a standard outlet box. In order to meet these requirements, the preferred embodiment utilises as far as possible normal operating mechanisms but replaces the normal fixed linkage between the manually operable switch on the outlet and the actual mains contact mechanism with a controllable coupling mechanism.

[0007] Referring to the diagrammatic sketch shown in Fig. 1, the normal mains contact operating mechanism is indicated by the reference numeral 10. The mechanism consists of a contact carrier 12 carrying contacts 14 which in normal operation are biased by a biasing means 15 to a normally open condition with respect to fixed contacts 16. The contact carrier is arranged to rotate in a plane normal to the plane of the paper in Figure 1.

[0008] A manually operable switch mechanism is generally indicated by reference numeral 18 and consists of a rocker switch 19 which is of the usual bistable type resulting from the use of an over-centre spring arrangement "where the rotational force required to overcome the spring to turn from on to off is greater than the rotational force exerted by the biasing spring 15, such that the switch system as a whole is also bi-stable for as long as the device is untripped. Between the manually operable mechanism 18 and the switch contact mechanism 10, is provided a controllable coupling mechanism 20 in the form of an axial clutch. The axial clutch is formed by a plate member 21 which faces a side wall 22 of the contact carrier 12. The facing surfac-

es 21,22 are provided with one or more inter-engaging projections and recesses; the projections 22a being shown in more detail in Figure 3. The plate 21 is arranged to be movable by the manually operable mechanism 18 in a rotational direction in and out of the paper as seen in Figure 1 but is capable of transverse or axial movement i.e to the left and right as shown in Figure 1 under the control of a fault detection system indicated generally by the reference numeral 28.

[0009] In the preferred embodiment, the arrangement is such that the fault detection mechanism 28 in the absence of a fault, causes the plate 21 to be held in engagement with the surface 22 on the contact carrier 12 so that movement of the manually operable mechanism 18 will also move the contact carrier 12 to open or close the power contacts. This is achieved by interposing a movable member 23 between a surface 24 provided on an extension 25 to the plate 21 and a relatively fixed surface 26. The member 23 interposed between the surface 24 and fixed member 26 prevents any axial movement of the plate 21. However, when a fault condition is detected, the member 23 is withdrawn which allows relative movement between the members 24 and 26 which thus permits the plate 21 to move axially as a result of interaction between the projections and recesses on the contact carrier 12 and plate 21. The projections 22a and recesses have angled engaging surfaces which are designed so that the biasing means 15 exerts a sufficient rotational force on the contact carrier 12 to force the plate away from the surface 22 when the moveable member 23 is not interposed between the surface 24 and fixed surface 26.

[0010] The above described arrangement thus results in the mains contacts becoming open but without operating the mechanism 18 to cause it to revert to an "off" position also. It is a requirement that a manual flag 30 be provided with all RCD devices in order to accurately indicate the status of the power contacts and due to the fact that in the present mechanism the manually operable switch is not moved to an "off" position by the detection of a fault, it is proposed to provide the flag within the manually operable switch itself by providing a window in the top of the switch as shown in Figure 2. A flag is connected to the contact carrier 12 and is arranged to be exposed in the window when the switch member is in the "on" position and the contacts are also closed. In the event of the contacts opening due to a fault, the flag either disappears or is replaced by a different colour flag to indicate that the socket is non-operative.

[0011] A further advantage of the above arrangement is that in order to reset a socket which has been tripped by a fault condition, all that is required is that the switch rocker 19 be returned to the "off" position and then placed into the "on" position again. If the fault has been cleared in the meantime then the switch will reset. However, if the fault is still present the operation of the rocker switch will have no effect on the contact carrier 12 due to the fact that the plate 21 will simply move axially as

it also moves rotationally in response to operation of the rocker 19.

[0012] As an additional indication, it is possible to provide a further visual or audible indication that the socket has tripped due to a fault condition and this can be done in any convenient way having regard to the space limitations.

[0013] In order to provide a better indication of the actual construction of the important parts of the present mechanism attention is directed to Figure 3 which shows in an exploded perspective view a portion of the contact carrier 12 with the flag attached as well as the controlled coupling member. Rather than repeat the above description the same reference numerals have been used in Figure 3 as have been used in Figure 1. The arms 31 engage the rocker switch 19 and cause the contact carrier to move with the rocker switch 19 in the absence of a fault.

Claims

1. A switched mains electrical outlet comprising:

- first contacts (16);
- second contacts (14) mounted on a contact carrier means (12) arranged to be moveable to allow the second contacts to close with the first contacts;
- manually operable switching means (18); and
- fault detection means (22) arranged to control the mode of operation to automatically open the first and second contacts (14,16) in the presence of a fault;

characterised in that the contact carrier means (12) is arranged to rotate about an axis to allow closure of the first and second contacts (14,16) and the manually operable switching means (18) is arranged to rotate about said axis, and in that there are linkage means (20) between the contact carrier means (12) and the manually operable switching means (18) capable of adopting one of two modes of operation in response to the fault detection means (22), wherein

in the first mode of operation the linkage means (20) causes the contact carrier means (12) to axially engage the manually operable switching means (18) thereby preventing relative rotation therebetween whereby to allow the first and second contacts (14,16) to be switched closed; and wherein

in the second mode of operation the linkage means (20) causes the contact carrier means to axially disengage from the manually operable switching means thereby allowing relative rotation therebetween whereby to permit the first

and second contacts to open or to remain open in the presence of a fault.

2. An outlet according to claim 1 further comprising contact carrier return (15) means arranged to rotate the contact carrier means to open the contacts in the second mode of operation of the linkage.

3. An outlet according to claim 2, wherein said contact carrier return means (15) is a spring.

4. An outlet according to any of the preceding claims, wherein the linkage (20) is in the form of a controllable axially moving clutch.

5. An outlet according to claim 4, wherein the axially moving clutch comprises:

a first plate having a number of angled depressions; and

a second plate (22) having a corresponding number of angled pins (22a) arranged to fit into the depressions when the plates (21,22) are engaged together;

wherein upon application of a torque movement to the clutch the angled pins (22a) and depressions create an axial force which in the second mode of operation is sufficient to disengage the plates and in the first mode of operation is not sufficient to disengage the plates.

6. An outlet according to any of the preceding claims, further comprising means (30) for indicating whether the contacts are open or closed.

7. An outlet according to claim 6, wherein the indicating means (30) is in the form of a mechanical element which is visible to a user when the contacts are closed.

8. An outlet according to any one of claims 1 to 4, wherein the manually operable switching means is in the form of a rocker (19).

9. An outlet according to claim 8 when dependent upon claims 6 or 7, wherein the rocker (19) is provided with an aperture through which the indicating means (30) is visible.

10. An outlet according to any one of the preceding claims, wherein the fault detection means (22) includes an electrically operable device (22,23) arranged to control the mode of operation of the linkage (20).

11. An outlet according to claim 10, wherein the electrically operable device comprises a solenoid (22), the

armature (23) of which is arranged to engage the linkage to control the mode of operation adopted by the linkage (20).

12. An outlet according to claim 10 when dependent upon claim 4 or 5 wherein the electrically operable device comprises a solenoid (22), the armature (23) of which is arranged to prevent axial movement of the clutch (21,22) when the linkage (20) is in the first mode of operation, and to allow axial movement of the clutch when the linkage is in the second mode of operation.

15 Revendications

1. Sortie électrique secteur commutée comprenant :

des premiers contacts (16) ;

des deuxièmes contacts (14) montés sur un moyen (12) de support de contact agencé pour être mobile pour permettre aux deuxièmes contacts de se fermer avec les premiers contacts ; un moyen de commutation (18) actionnable manuellement ; et

un moyen (22) de détection d'erreur agencé pour commander le mode de fonctionnement pour ouvrir automatiquement les premiers et deuxièmes contacts (14, 16) en présence d'une erreur ;

caractérisée en ce que le moyen (12) de support de contact est agencé pour tourner autour d'un axe pour permettre la fermeture des premiers et deuxièmes contacts (14, 16) et le moyen de commutation (18) actionnable manuellement est agencé pour tourner autour d'un axe, et en ce qu'il y a un moyen de liaison (20) entre le moyen (12) de support de contact et le moyen de commutation (18) actionnable manuellement capable d'adopter l'un de deux modes de fonctionnement en réponse au moyen de détection d'erreur, dans laquelle

dans le premier mode de fonctionnement, le moyen de liaison (20) conduit le moyen (12) de support de contact à coopérer axialement avec le moyen de commutation (18) actionnable manuellement afin d'empêcher une rotation relative entre eux, aux fins de permettre aux premiers et deuxièmes contacts (14, 16) d'être commutés à l'état fermé ; et dans laquelle dans le deuxième mode de fonctionnement, le moyen de liaison (20) conduit le moyen de support de contact à se libérer axialement du moyen de commutation actionnable manuellement afin de permettre une rotation relative entre eux, aux fins de permettre aux premiers et deuxièmes contacts de s'ouvrir ou de rester

ouverts en présence d'une erreur.

2. Sortie selon la revendication 1, comprenant en outre un moyen (15) de retour de support de contact agencé pour faire tourner le moyen de support de contact pour ouvrir les contacts dans le deuxième mode de fonctionnement de la liaison. 5
3. Sortie selon la revendication 2, dans laquelle le moyen (15) de retour de support de contact est un ressort. 10
4. Sortie selon l'une quelconque des revendications précédentes, dans laquelle la liaison (20) se présente sous la forme d'un embrayage mobile axialement pouvant être commandé. 15
5. Sortie selon la revendication 4, dans laquelle l'embrayage mobile axialement comprend : 20
 - une première plaque comportant un certain nombre de cavités angulaires ; et
 - une deuxième plaque (22) comportant un nombre correspondant de broches angulaires (22a) agencées pour s'adapter dans les cavités lorsque les plaques (21, 22) coopèrent mutuellement ;
 - dans laquelle, lors de l'application d'un mouvement de torsion à l'embrayage, les broches (22a) et les cavités angulaires créent une force axiale qui, dans le deuxième mode de fonctionnement, est suffisante pour libérer les plaques et dans le premier mode de fonctionnement, n'est pas suffisante pour libérer les plaques. 30
6. Sortie selon l'une quelconque des revendications précédentes, comprenant en outre un moyen (30) pour indiquer si les contacts sont ouverts ou fermés. 35
7. Sortie selon la revendication 6, dans laquelle le moyen d'indication (30) se présente sous la forme d'un élément mécanique qui est visible par un utilisateur lorsque les contacts sont fermés. 40
8. Sortie selon l'une quelconque des revendications 1 à 4, dans laquelle le moyen de commutation actionnable manuellement se présente sous la forme d'un interrupteur à bascule (19). 45
9. Sortie selon la revendication 8 lorsqu'elle dépend de la revendication 6 ou 7, dans laquelle l'interrupteur à bascule (19) est pourvu d'une ouverture à travers laquelle le moyen d'indication (30) est visible. 50
10. Sortie selon l'une quelconque des revendications précédentes, dans laquelle le moyen (22) de détection d'erreur comporte un dispositif (22, 23) actionnable électriquement agencé pour commander le 55

mode de fonctionnement de la liaison (20).

11. Sortie selon la revendication 10, dans laquelle le dispositif actionnable électriquement comprend une bobine de solénoïde (22) dont l'armature (23) est agencée pour coopérer avec la liaison pour commander le mode de fonctionnement adopté par la liaison (20).
12. Sortie selon la revendication 10 lorsqu'elle dépend de la revendication 4 ou 5, dans laquelle le dispositif actionnable électriquement comprend une bobine de solénoïde (22) dont l'armature (23) est agencée pour empêcher un déplacement axial de l'embrayage (21, 22) lorsque la liaison (20) est dans le premier mode de fonctionnement, et pour permettre un déplacement axial de l'embrayage lorsque la liaison est dans le deuxième mode de fonctionnement.

Patentansprüche

1. Elektrische Schalter-Netzsteckdose, die umfasst:
 - erste Kontakte (16),
 - zweite Kontakte (14), die an einem Kontaktträgermittel (12) angebracht sind, das bewegbar angeordnet ist, damit die zweiten Kontakte mit den ersten Kontakten schließen können,
 - eine von Hand betätigbares Schaltermittel (18) und
 - ein Fehlererfassungsmittel (22), das angeordnet ist, die Betriebsart zu kontrollieren, um automatisch die ersten und zweiten Kontakte (14, 16) beim Vorliegen eines Fehlers zu öffnen;
- dadurch gekennzeichnet**, dass das Trägermittel (12) um eine Achse drehbar angeordnet ist, um das Schließen der ersten und zweiten Kontakte (14, 16) zu ermöglichen, und dass das von Hand betätigbare Schaltermittel (18) um diese Achse drehbar angeordnet ist, und dass es ein Verbindungsmittel (20) zwischen dem Kontaktträgermittel (12) und dem von Hand betätigbaren Schaltermittel (18) gibt, das eine von zwei Betriebsarten in Antwort auf das Fehlererfassungsmittel (22) einnehmen kann, wobei
- in der erste Betriebsart das Verbindungsmittel (20) bewirkt, dass das Kontaktträgermittel (12) axial an dem von Hand betätigbaren Schaltermittel (18) eingreift, wodurch eine relative Drehung dazwischen verhindert wird und die ersten und zweiten Kontakte (14, 16) nach geschlossen geschaltet werden können, und wobei

in der zweiten Betriebsart das Verbindungsmittel (20) bewirkt, dass das Kontaktträgermittel axial mit dem von Hand betätigbaren Schaltermittel außer Eingriff kommt, wodurch eine relative Drehung dazwischen ermöglicht wird, so dass sich die ersten und zweiten Kontakte öffnen können oder beim Vorliegen eines Fehlers geöffnet bleiben.

2. Steckdose nach Anspruch 1, die des weiteren ein Kontaktträgersrückführmittel (15) umfasst, das zum Drehen des Kontaktträgermittels angeordnet ist, um die Kontakte in der zweiten Betriebsart der Verbindung zu öffnen.

3. Steckdose nach Anspruch 2, wobei das Kontaktträgersrückführmittel (15) eine Feder ist.

4. Steckdose nach einem der vorhergehenden Ansprüche, wobei die Verbindung (20) in der Form einer steuerbaren, axialbewegbaren Kupplung ist.

5. Steckdose nach Anspruch 4, wobei die sich axial bewegende Kupplung umfasst:

eine erste Platte mit einer Anzahl winkelmäßiger Vertiefungen, und

eine zweite Platte (22) mit einer entsprechenden Anzahl winkelmäßiger Zapfen (22a), die in die Vertiefungen passen, angeordnet sind, wenn die Platten (21, 22) ineinander eingreifen,

wobei bei Anwendung einer Drehmomentbewegung auf die Kupplung die winkelmäßigen Zapfen (22a) und die Vertiefungen eine Axialkraft erzeugen, die in der zweiten Betriebsart ausreichend ist, die Platten auszukuppeln und in der ersten Betriebsart nicht ausreichend ist, die Platten auszukuppeln.

6. Steckdose nach einem der vorhergehenden Ansprüche, die des Weiteren Mittel (30) zur Angabe umfasst, ob die Kontakte geöffnet oder geschlossen sind.

7. Steckdose nach Anspruch 6, wobei das Anzeigemittel (30) in der Form eines mechanischen Elements ist, das für einen Benutzer sichtbar ist, wenn die Kontakte geschlossen sind.

8. Steckdose nach einem der Ansprüche 1 bis 4, wobei das von Hand betätigbare Schaltermittel in der Form einer Wippe (19) ist.

9. Steckdose nach Anspruch 8, wenn von Anspruch 6 oder 7 abhängig, wobei die Wippe (19) mit einer Öffnung versehen ist, durch die das Anzeigemittel (30)

sichtbar ist.

10. Steckdose nach einem der vorhergehenden Ansprüche, wobei das Fehlererfassungsmittel (22) eine elektrisch betätigbare Einrichtung (22, 23) umfasst, die angeordnet ist, die Betriebsart der Verbindung (20) zu kontrollieren.

11. Steckdose nach Anspruch 10, wobei die elektrisch betätigbare Einrichtung ein Solenoid (22) umfasst, dessen Anker (23) angeordnet ist, um die von der Verbindung (20) eingenommene Betriebsart zu steuern.

12. Steckdose nach Anspruch 10, wenn von Anspruch 4 oder 5 abhängig, wobei die elektrisch betätigbare Einrichtung ein Solenoid (22) umfasst, dessen Anker (23) angeordnet ist, damit er eine axiale Bewegung der Kupplung (21, 22) verhindert, wenn die Verbindung (20) in der ersten Betriebsart ist, und eine axiale Bewegung der Kupplung zulässt, wenn die Verbindung in der zweiten Betriebsart ist.

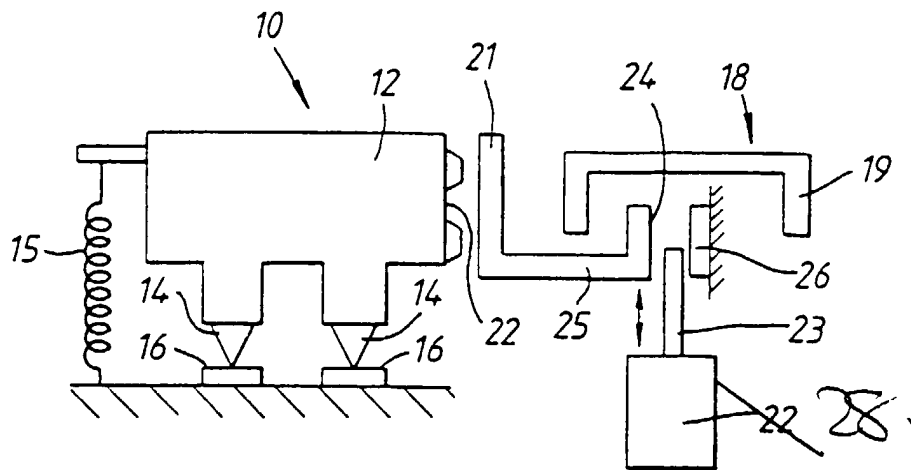


Fig.1

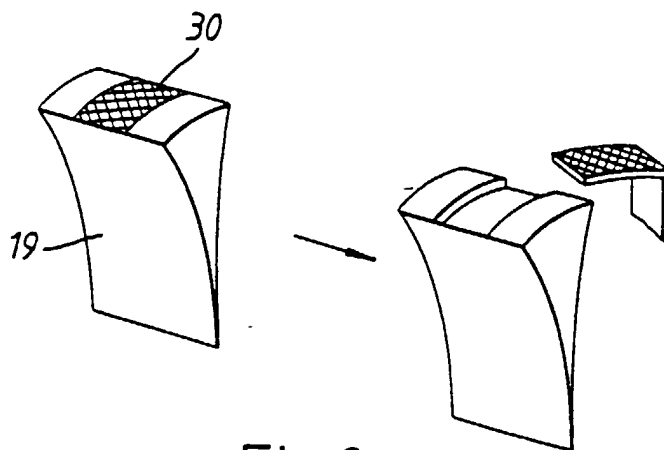


Fig.2

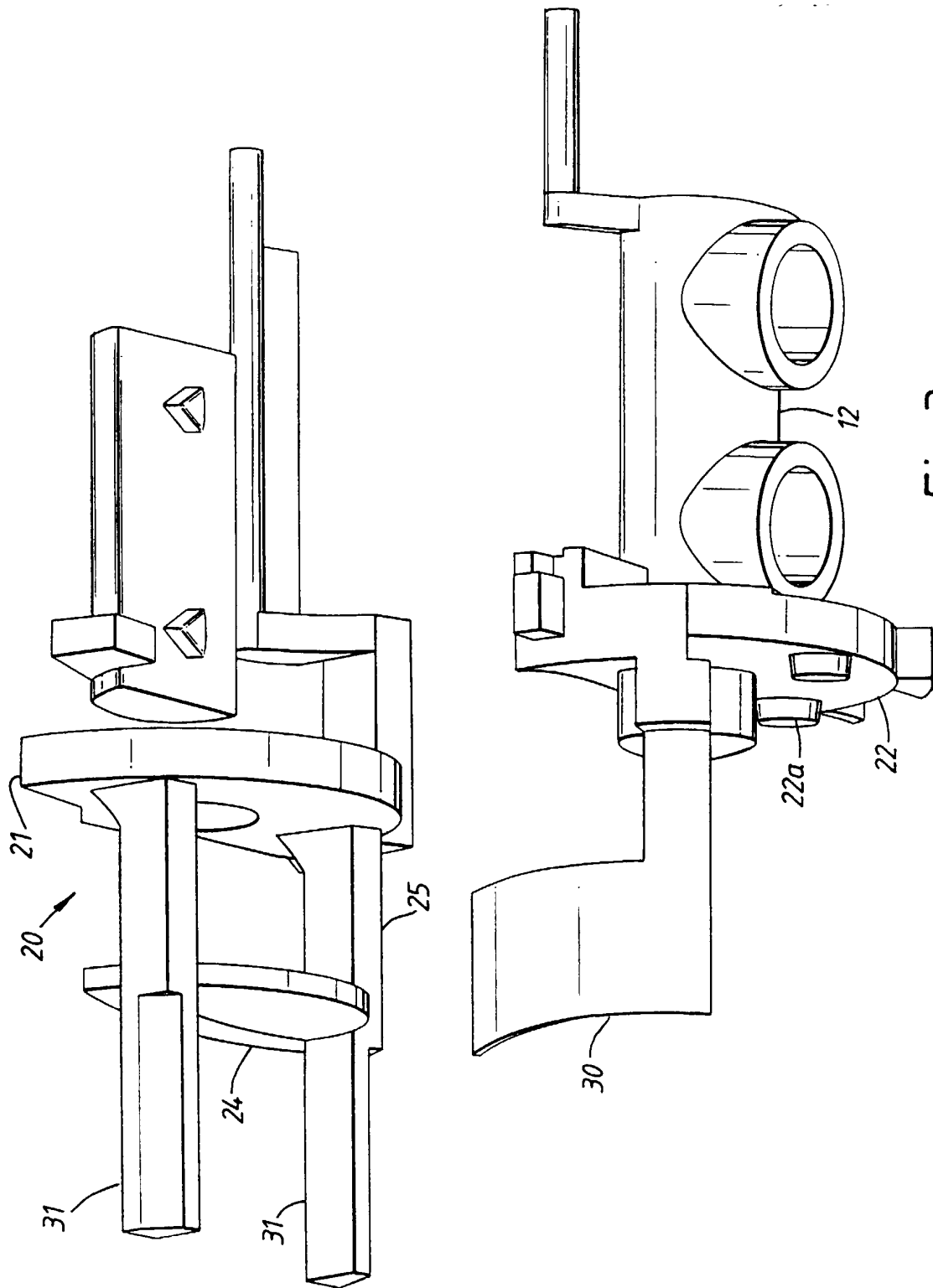


Fig.3