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(54) **MECHANICAL COMPRESSION RELEASE**

MECHANISCHE DEKOMPRESSIONSVORRICHTUNG

COMMANDE DE DECOMPRESSION MECANIQUE

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## Description

FIELD OF THE INVENTION

**[0001]** This invention relates to internal combustion engines, and more particularly to a centrifugally responsive mechanical compression release.

BACKGROUND OF THE INVENTION

**[0002]** Compression release mechanisms are common in pull-start engines to make the engines easier to start. In a normal pull-start engine, the operator pulls a rope which moves the engine through one or more cycles. During the compression stroke of the engine cycle, the operator must exert enough force to compress the air in the combustion chamber, and the additional force from compressing the air makes it more difficult to start the engine. In a pull-start engine with a compression release mechanism, pressure in the combustion chamber is slightly released during the compression stroke to reduce the resistive force on the rope. This makes the engine easier to start because the operator does not have to pull the rope as hard. Typically, a compression release mechanism slightly unseats the exhaust valve to vent the combustion chamber during starting while the engine is revolving at cranking speeds. The mechanism then typically disengages when the engine reaches normal operating speeds.

**[0003]** Some compression release mechanisms use centrifugal forces to disengage themselves from the cam follower. These designs generally have a cam member and a flyweight. When the cam shaft rotation speed reaches a certain point, the flyweight moves away from the cam shaft, which positions the cam member out of contact with the cam follower. Some previous saddle-type compression release designs had pivot points on the cam shaft that required machining or drilling of the cam shaft. Modifying and machining a cam shaft is difficult because of its hardness and curved surface. The flyweights of some saddle-type designs also required apertures in the cam gear for clearance.

**[0004]** Other compression release mechanisms involve complex shapes that are difficult to manufacture and assemble. Complex designs usually require additional manufacturing steps which increase the cost of the part. Also, a complex part usually takes longer to assemble and is more likely to be assembled improperly.

SUMMARY OF THE INVENTION

**[0005]** In accordance with the present invention there is provided an internal combustion engine, comprising:

a cam shaft;
a cam having
  a cam lobe that engages a cam follower to lift an engine valve;
  a base radius; and a compression release member,

the engine being characterized in that said compression release member is pivotably retained by a retainer adjacent said base radius, said compression release member engages said cam follower at engine starting speeds, and has a pivot axis that is substantially transverse to but does not intersect said cam shaft.

**[0006]** Desirably said retainer is at least one pivot pin that retains said compression release member.

**[0007]** More desirably said retainer includes two nubs formed integral with said cam.

**[0008]** Conveniently a slot is formed in said base radius, and said compression release member is disposed within said slot.

**[0009]** Preferably said slot is partially defined by a back surface that bears load forces imparted on said compression release member by said cam follower.

**[0010]** Conveniently said pivot axis is substantially parallel to said back surface.

**[0011]** Preferably said cam shaft extends in a vertical direction during normal engine operation, said compression release member has an auxiliary cam surface that engages the cam follower, said compression release member has a pivot axis, and the auxiliary cam surface is disposed at a position lower than said pivot axis in the vertical direction.

**[0012]** Desirably said compression release member has an arc-shaped auxiliary cam surface that engages the cam follower.

**[0013]** Preferably said compression release member pivots about a pivot axis, and said compression release member is symmetrical about said pivot axis.

**[0014]** Desirably said compression release member is substantially V-shaped.

**[0015]** More preferably said compression release member includes a first portion having an auxiliary cam surface that engages said cam follower; a second portion having sufficient mass to function as a flyweight; and a bridging portion that interconnects said first and second portions.

**[0016]** Conveniently said first and second portions are substantially identical.

**[0017]** Desirably said compression release member pivots about a pivot axis disposed between said first and second portions.

**[0018]** Preferably the pivot axis is disposed between said base radius and said cam shaft.

**[0019]** Preferably said cam includes a back surface that bears load forces imparted on said compression release member by said cam follower, and said compression release member includes a U-shaped portion having a rounded surface that contacts said back surface while said compression release member pivots with respect to said cam.

**[0020]** Desirably said compression release member pivots between an engaged position, in which said auxiliary cam surface engages said cam follower at engine starting speeds, and a disengaged position, in which said auxiliary cam surface does not engage said cam follower, and wherein both said first and second portions are disposed radially outwardly from said pivot axis with respect to said cam shaft when said compression release member is in the disengaged position.

**[0021]** In a preferred embodiment, the compression release member may be symmetrical about a line through the bridging portion, but by no means is the invention limited to this embodiment. A symmetrical design provides additional benefits, but is not necessary to practice this invention.

**[0022]** In operation of preferred embodiments, the cam follower contacts the cam lobe as the cam shaft rotates. The compression release member is located in a slot along the base radius. At low speeds, the auxiliary cam surface engages the cam follower and slightly lifts the cam follower from the cam. Once the engine reaches higher running speeds, centrifugal forces pivot the compression release member out of contact with the cam follower.

**[0023]** Preferred embodiments of the present invention achieve many advantages over previous compression release mechanisms. Biasing springs are not needed when the invention is incorporated into vertical shaft engines. The costly process of machining the cam shaft is no longer necessary because the compression release member is preferably integrated into the cam, which can be slip fit over the cam shaft. This arrangement can be readily integrated into an engine utilizing a cam lever and direct lever overhead valve system.

**[0024]** The back surface of the slot bears the forces the cam follower applies upon the compression release member. This substantially flat back surface is capable of supporting a relatively large amount of force and minimizes the forces applied on the pivot pin. The auxiliary cam surface is curved so there are no corners to cut into the cam follower. The cam follower is also preferably curved, and this smooth transition of the cam follower from the base radius to the compression release member extends the life of the parts.

**[0025]** In a preferred embodiment applied to a 5 hp engine, the compression release member is approximately 0.375 inches wide. This width dimension is wider than most previous compression release mechanisms and allows the forces transferred to the back surface to be distributed along a larger surface area. One skilled in the art will realize the invention does not require this large of a width dimension, and the size of the compression release member ultimately depends on the size of the cam lobe and the engine. The invention is by no means limited to this dimension, which merely provides an additional benefit of the preferred embodiment.

**[0026]** Additional advantages of this invention are derived from its efficient design. The compression release member may be easily stamped, or cut from a metal coil and bent into the proper shape. As previously mentioned, the compression release member may be symmetrical about a line through the bridging portion. While not necessary, the symmetrical design provides benefits during assembly of the invention. Since both the first and second portions are substantially the same in this embodiment, either arced surface may be the auxiliary cam surface; the compression release member cannot be placed in the slot upside-down. This feature saves time during the assembly process, eliminates many mis-assembled parts, and reduces costs.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0027]**

Fig. 1 is a perspective view of the cam follower and cam gear with the compression release member in the disengaged position.

Fig. 2 is a cross-sectional view, taken along line 2-2 of Fig. 1.

Fig. 3 is a perspective view of the cam gear with the compression release member in the engaged position.

Fig. 4 is a cross-sectional view, taken along line 4-4 of Fig. 3 with the cam follower in contact with the compression release member.

Fig. 5 is a bottom view of an overhead valve engine embodying the invention with the engine crankcase cover removed.

Fig. 6 is a top view of the cam gear showing nubs to retain the compression release member.

Fig. 7 is a top view of the cam gear showing a pivot pin to retain the compression release member.

Fig. 8 is a perspective view of an alternative embodiment of the cam follower and cam gear with the compression release member in the disengaged position.

Fig. 9 is a cross-sectional view, taken along line 9-9 of Fig. 8.

**[0028]** Before the embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangements of components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

## DETAILED DESCRIPTION

**[0029]** FIGS. 3 and 4 illustrate the cam 4 with the compression release member 24 in the engaged position while the engine is rotating at starting speeds. The cam 4 includes a cam lobe 8, a base radius 16, and a slot 20 that extends into, and is formed in the base radius 16. The compression release member 24 is pivotably retained in the slot 20 between the base radius 16 and the cam shaft 2.

**[0030]** In FIG. 4, the compression release member 24 is substantially V-shaped and consists of a first portion 40, a second portion 44 and a bridging portion 48. The first portion 40 and second portion 44 are preferably substantially flat surfaces. An arc-shaped auxiliary cam surface 36 at the end of the first portion 40 extends slightly beyond the base radius 16 to contact the cam follower 12. The second portion 44 preferably has sufficient mass to function as a flyweight. Preferably, the bridging portion 48 is substantially U-shaped and interconnects the first portion 40 and second portion 44. The pivot pin 28 is disposed within the curved segment of the bridging portion 48.

**[0031]** In the preferred embodiment, the first portion 40 and second portion 44 may be substantially identical and the compression release member may be symmetrical about a line through the bridging portion 48 that is substantially parallel to the pivot axis 56 (Fig. 3). This configuration is not necessary for the invention to function, but a symmetrical design offers advantages during the device's assembly. If the first portion 40 and second portion 44 are interchangeable, the compression release member 24 can be installed with the first and second portions 40, 44 reversed. This eliminates confusion, saves time, and reduces costs during assembly.

**[0032]** The overall design of the compression release member 24 provides for cost effective manufacturing methods. Preferably, the compression release member 24 is cut from a strip of coiled metal and bent into the desired shape. The compression release member 24 could also be starr ped from a metal strip or sheet. Relatively little waste material is generated from these processes due to the part's efficient design. The inexpensive material along with the uncomplicated manufacturing process leads to the reduced cost of the compression release member 24.

**[0033]** The compression release member 24 is preferably retained in the slot 20 by a pivot pin 28. In the preferred embodiment, planes containing the substantially flat surfaces 42, 46 respectively of the first portion 40 and the second portion 44 are substantially parallel to the pivot axis 56. The compression release member 24 is free to pivot about the pivot pin 28, and the pivot axis 56 of the compression release member 24 substantially passes through the pivot pin 28. The compression release member 24 is positioned such that the cam shaft 2 and the pivot axis 56 do not intersect. Costly machining of the cam shaft 2 is no longer needed because the pivot axis 56 is offset from the cam shaft 2.

**[0034]** The pivot pin 28 preferably does not support the force exerted on the compression release member 24 by the cam follower 12. The bridging portion 48 contacts the back surface 32 which buttresses the compression release member 24. Most of the force the cam follower 12 applies on the compression release member 24 is absorbed by the back surface 32. Because of this arrangement, the pivot pin 28 will not suffer from large shear stresses and may last longer.

**[0035]** While in the engaged position, the first portion 40 contacts the shoulder 22, which provides vertical support for the compression release member 24. In the preferred embodiment, the first portion 40 is positioned vertically below the pivot pin 28 when installed on a vertical shaft engine. When the auxiliary cam surface 36 is below the pivot pin 28, gravity returns the compression release member 24 to the engaged position, so a biasing spring is not needed in vertical shaft applications. A return spring may be needed in a horizontal shaft application. This arrangement also allows the cam follower 12 to apply a downward force upon the compression release member 24 and prevent the compression release member 24 from moving out of the engaged position prematurely. Another feature is that once the speed increases enough to move the auxiliary cam surface 36 above the pivot pin 28, the cam follower 12 will help push the compression release member 24 to the disengaged position.

**[0036]** FIGS. 1 and 2 illustrate the compression release member 24 in the disengaged position. As the rotation speed of the cam 4 reaches normal running speeds, the flyweight second portion 44 is centrifugally forced away from the cam shaft 2, causing the compression release member 24 to pivot into the disengaged position. The auxiliary cam surface 36 then moves out of contact from the cam follower 12. In the preferred embodiment applied to a 5 hp engine, the kick-out speed when the compression release member moves to the disengaged position is approximately 600 RPM, but it could vary between 300 and 1200 RPM. The compression release member 24 in the preferred embodiment pivots approximately 20 degrees, but one skilled in the art will recognize that this angle depends on the length of the compression release member 24 and size of the engine. In an engine with a cam 4 having a smaller base radius 16 and shorter compression release member 24, the compression release member 24 may pivot 25 to 30 degrees before the auxiliary cam surface 36 disengages from the cam follower 12.

**[0037]** A preferred embodiment of the mechanical compression release 24 of the present invention is illustrated in FIG. 5 as it would appear in a vertical shaft engine with a direct lever overhead valve system. A preferred embodiment has one cam lobe 8. An alternative embodiment could have two cam lobes, one for each valve actuation. The cam 4 preferably slips over the cam shaft 2 and rotates about the cam shaft 2, which is pressed into the crankcase cover. In this embodiment, the cam shaft 2 is stationary, although the cam shaft 2 could rotate with the cam lobe 8 in other embodiments.

**[0038]** The cam 4 preferably consists of the base radius 16 and the cam lobe 8. The cam followers 12, 14 control the exhaust and intake valves respectively and contact the cam 4 as it rotates. A valve is closed when a cam follower 12, 14 engages the base radius 16, and opened when a cam follower 12, 14 engages the cam lobe 8. The cam followers 12, 14 respectively for the exhaust and intake valves preferably contact the cam 4 at slightly different levels. The cam 4 preferably has a slot 20 that extends into the base radius 16. A compression release member 24 is preferably disposed within this slot 20 at a level that is only capable of contacting the exhaust valve cam follower 12 as the cam 4 rotates. In the alternative, compression release member 24 could operate on the intake valve.

**[0039]** FIG. 7 illustrates a view of the cam 4. The compression release member 24 of the present invention is preferably interconnected with the rotating cam 4, although the compression release member 24 could be placed in other locations. In the preferred embodiment, the compression release member 24 is disposed within the slot 20, and the auxiliary cam surface 36 extends slightly beyond the base radius 16. In the preferred embodiment, the compression release member 24 can be located between the base radius 16 and the cam shaft 2 because this engine design uses a relatively large cam 4.

**[0040]** The auxiliary cam surface 36 is preferably arc-shaped so there are no corners to contact the cam follower 12 (FIG. 3) and cause excessive wear. Cam follower 12 (FIG. 3) is also preferably arc-shaped to reduce wear on the parts. As the cam 4 rotates, the compression release member 24 preferably moves the cam follower 12 (FIG. 3) far enough from the base radius 16 to slightly open the exhaust valve. The shape of the auxiliary cam surface 36 is selected to obtain a specific valve opening profile. In the preferred embodiment applied to a 5 hp engine of the direct lever type, the compression release member 24 causes the exhaust valve to open approximately 0.035 inches.

**[0041]** The compression release member 24 is preferably retained by a retainer. As illustrated in FIG. 7, the compression release member 24 is retained by the pivot pin 28. In an alternate embodiment illustrated in FIG. 6, nubs 128 are used to retain the compression release member 24. The cam 4 may be fabricated with the nubs 128 integrally formed on the opposing side walls 134, 135 of the slot 20. Preferably, the nubs 128 are at the end of flexible extensions 130 that interconnect them to the slot 20. With the nubs 128, the compression release member 24 can simply be pressed into place without the additional assembly step of installing the pivot pin 28 (FIG. 7). The flexible extensions 130 allow the nubs 128 to bend and provide clearance for the compression release member 24, and then return to their original positions to properly retain the compression release member 24.

**[0042]** The nubs 128 serve the same function as the pivot pin 28 (FIG. 7) and eliminate the need for a separate pivot pin 28 (FIG. 7). The design of the cam 4 and the compression release member 24 allows the nubs 128 to be substituted for the relatively stronger pivot pin 28 (FIG. 7). As mentioned above, the force applied on the compression release member 24 by the cam follower 12 (FIG. 3) is supported by the back surface 32. Therefore the nubs 128 preferably only retain the compression release member 24, and do not have to be of sufficient strength to support all of the forces applied on the compression release member 24.

**[0043]** Another alternate embodiment is illustrated in FIGS. 8 and 9 in which the slot 220 does not extend all the way to the base radius 216. In this embodiment, the edge of the cam 204 gradually slopes to the shoulder 222 instead of suddenly dropping off near the end of the slot 20 (FIG. 4). This embodiment shows the compression release member 24 in the disengaged position, and the cam follower 12 contacting the base radius 216. The edge of the cam 204 near the base radius 216 slopes to meet the shoulder 222, but there is still enough surface remaining on the base radius 216 to properly position the cam follower 12.

## Claims

1. An internal combustion engine, comprising:

   a cam shaft (2);
   a cam (4) having

      a cam lobe (8) that engages a cam follower (12) to lift an engine valve;
      a base radius (16); and a compression release member (24), the engine being **characterized in that** said compression release member (24) is pivotably retained by a retainer (28, 128) adjacent said base radius (16), said compression release member (24) engages said cam follower (12) at engine starting speeds, and has a pivot axis (56) that is substantially transverse to but does not intersect said cam shaft (2).

2. An engine as claimed in claim 1, **characterized in that** said retainer is at least one pivot pin (28) that retains said compression release member (24).

3. An engine as claimed in claim 1, **characterized in that** said retainer includes two nubs (128) formed integral with said cam (4).

4. An engine as claimed in claim 1, **characterized by** a slot (20) formed in said base radius, wherein said compression release member is disposed within said slot.

**5.** An engine as claimed in claim 4, **characterized in that** said slot is partially defined by a back surface (32) that bears load forces imparted on said compression release member by said cam follower.

**6.** An engine as claimed in claim 1, **characterized in that** said pivot axis (56) is substantially parallel to said back surface (32).

**7.** An engine as claimed in claim 1, **characterized in that** said cam shaft extends in a vertical direction during normal engine operation, wherein said compression release member has an auxiliary cam surface (36) that engages the cam follower, wherein said compression release member has a pivot axis, and wherein the auxiliary cam surface is disposed at a position lower than said pivot axis in the vertical direction.

**8.** An engine as claimed in claim 1, **characterized in that** said compression release member has an arc-shaped auxiliary cam surface (36) that engages the cam follower.

**9.** An engine as claimed in claim 1, **characterized in that** said compression release member pivots about a pivot axis, and wherein said compression release member is symmetrical about said pivot axis.

**10.** An engine as claimed in claim 1, **characterized in that** said compression release member is substantially V-shaped.

**11.** An engine as claimed in claim 1, **characterized in that** said compression release member includes:

a first portion (40) having an auxiliary cam surface that engages said cam follower;
a second portion (44) having sufficient mass to function as a flyweight; and
a bridging portion (48) that interconnects said first and second portions.

**12.** An engine as claimed in claim 11, **characterized in that** said first and second portions are substantially identical.

**13.** An engine as claimed in claim 11, **characterized in that** said compression release member pivots about a pivot axis disposed between said first and second portions.

**14.** An engine as claimed in claim 1, **characterized in that** the pivot axis is disposed between said base radius and said cam shaft.

**15.** An engine as claimed in claim 1, **characterized in that** said cam includes a back surface that bears load forces imparted on said compression release member by said cam follower, and said compression release member includes a U-shaped portion having a rounded surface that contacts said back surface while said compression release member pivots with respect to said cam.

**16.** An engine as claimed in claim 13, **characterized in that** said compression release member pivots between an engaged position, in which said auxiliary cam surface engages said cam follower at engine starting speeds, and a disengaged position, in which said auxiliary cam surface does not engage said cam follower, and wherein both said first and second portions are disposed radially outwardly from said pivot axis with respect to said cam shaft when said compression release member is in the disengaged position.

## Patentansprüche

**1.** Verbrennungsmotor, der Folgendes umfasst:

eine Nockenwelle (2);

eine Nocke (4) mit

einer Nockenerhebung (8), die an einem Nockenstößel (12) angreift, um ein Motorventil zu heben;

einem Basisradius (16) und einem Dekompressionselement (24), wobei der Motor **dadurch gekennzeichnet ist, dass** das Dekompressionselement (24) von einem Halter (28, 128) neben dem Basisradius (16) schwenkbar gehalten wird, wobei das Dekompressionselement (24) bei Startdrehzahlen des Motors an dem Nockenstößel (12) angreift und eine Drehachse (56) hat, die im Wesentlichen transversal zu der Nockenwelle (2) ist, diese aber nicht schneidet.

**2.** Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** der Halter wenigstens ein Drehstift (28) ist, der das Dekompressionselement (24) festhält.

**3.** Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** der Halter zwei Noppen (128) aufweist, die einstückig mit der Nocke (4) ausgebildet sind.

**4.** Motor nach Anspruch 1, **gekennzeichnet durch** einen Schlitz (20), der in dem Basisradius ausgebildet ist, wobei das Dekompressionselement in dem Schlitz angeordnet ist.

5. Motor nach Anspruch 4, **dadurch gekennzeichnet, dass** der Schlitz teilweise durch eine Rückfläche (32) definiert wird, die Lastkräfte trägt, mit denen das Dekompressionselement durch den Nockenstößel beaufschlagt wird.

6. Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** die Drehachse (56) im Wesentlichen parallel zu der Rückfläche (32) ist.

7. Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** die Nockenwelle während des nonnalen Motorbetriebs in einer vertikalen Richtung verläuft, wobei das Dekompressionselement eine zusätzliche Nockenfläche (36) hat, die an dem Nockenstößel angreift, wobei das Dekompressionselement eine Drehachse hat und wobei sich die zusätzliche Nockenfläche an einer Stelle befindet, die niedriger ist als die Drehachse in der vertikalen Richtung.

8. Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** das Dekompressionselement eine bogenförmige zusätzliche Nockenfläche (36) hat, die an dem Nockenstößel angreift.

9. Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** das Dekompressionselement um eine Drehachse schwenkt und wobei das Dekompressionselement um die Drehachse symmetrisch ist.

10. Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** das Dekompressionselement im Wesentlichen V-förmig ist.

11. Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** das Dekompressionselement Folgendes aufweist:

    einen ersten Abschnitt (40) mit einer zusätzlichen Nockenfläche, die an dem Nockenstößel angreift;
    einen zweiten Abschnitt (44) mit einer ausreichenden Masse, um als Schwungmasse zu dienen; und
    einen Überbrückungsabschnitt (48), der den ersten und den zweiten Abschnitt miteinander verbindet

12. Motor nach Anspruch 11, **dadurch gekennzeichnet, dass** der erste und der zweite Abschnitt im Wesentlichen identisch sind.

13. Motor nach Anspruch 11, **dadurch gekennzeichnet, dass** das Dekompressionselement um eine Drehachse schwenkt, die zwischen dem ersten und dem zweiten Abschnitt angeordnet ist.

14. Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** die Drehachse zwischen dem Basisradius und der Nockenwelle angeordnet ist.

15. Motor nach Anspruch 1, **dadurch gekennzeichnet, dass** die Nocke eine Rückfläche aufweist, die Lastkräfte trägt, mit denen das Dekompressionselement durch den Nockenstößel beaufschlagt wird, und das Dekompressionselement einen U-förmigen Abschnitt mit einer gerundeten Fläche beinhaltet, die mit der Rückfläche in Kontakt ist, während das Dekompressionselement in Bezug auf die Nocke schwenkt.

16. Motor nach Anspruch 13, **dadurch gekennzeichnet, dass** das Dekompressionselement zwischen einer Eingriffsposition, in der die zusätzliche Nokkenfläche mit Startdrehzahlen des Motors an dem Nockenstößel angreift, und einer Ausrückposition schwenkt, in der die zusätzliche Nockenfläche nicht an dem Nockenstößel angreift, und wobei der erste und der zweite Abschnitt radial auswärts von der Drehachse in Bezug auf die Nockenwelle angeordnet sind, wenn das Dekompressionselement in der Ausrückposition ist.

## Revendications

1. Moteur à combustion interne, comprenant:

    un arbre à cames (2);
    une came (4), comportant
    un bossage de came (8) s'engageant dans un galet suiveur (12) pour soulever une soupape du moteur;
    un rayon de base (16); et un élément de commande de décompression (24), le moteur étant **caractérisé en ce que** ledit élément de commande de décompression (24) est retenu par pivotement par un élément de retenue (28, 128) en un point adjacent audit rayon de base (16), ledit élément de commande de décompression (24) s'engageant dans ledit galet suiveur (12) en présence de vitesses de démarrage du moteur, et comportant un axe de pivotement (56) pratiquement transversal audit arbre à cames (2) mais ne coupant pas celui-ci.

2. Moteur selon la revendication 1, **caractérisé en ce que** ledit élément de retenue est constitué par au moins un pivot (28) retenant ledit élément de commande de décompression.

3. Moteur selon la revendication 1, **caractérisé en ce que** ledit élément de retenue englobe deux tenons (128) formés d'une seule pièce avec ladite came (4).

**4.** Moteur selon la revendication 1, **caractérisé par** une fente (20) formée dans ledit rayon de base, ledit élément de commande de décompression étant agencé dans ladite fente.

**5.** Moteur selon la revendication 4, **caractérisé en ce que** ladite fente est en partie définie par une surface arrière (32) supportant les forces de charge appliquées audit élément de commande de décompression par ledit galet suiveur.

**6.** Moteur selon la revendication 1, **caractérisé en ce que** ledit axe de pivotement (56) est pratiquement parallèle à ladite surface arrière (32).

**7.** Moteur selon la revendication 1, **caractérisé en ce que** ledit arbre à cames s'étend dans une direction verticale lors du fonctionnement normal du moteur, ledit élément de commande de décompression comportant une surface à came auxiliaire (36), s'engageant dans le galet suiveur, ledit élément de commande de décompression comportant un axe de pivotement et ladite surface à came auxiliaire étant agencée au niveau d'une position plus basse que ledit axe de pivotement dans la direction verticale.

**8.** Moteur selon la revendication 1, **caractérisé en ce que** ledit élément de commande de décompression comporte une surface à came auxiliaire en forme d'arc (36) s'engageant dans le galet suiveur.

**9.** Moteur selon la revendication 1, **caractérisé en ce que** ledit élément de commande de décompression pivote autour d'un axe de pivotement, ledit élément de commande de décompression étant symétrique audit axe de pivotement

**10.** Moteur selon la revendication 1, **caractérisé en ce que** ledit élément de commande de décompression a pratiquement une forme en V.

**11.** Moteur selon la revendication 1, **caractérisé en ce que** ledit élément de commande de décompression englobe:

une première partie (40) comportant une surface à came auxiliaire s'engageant dans ledit galet suiveur;

une deuxième partie (44) ayant une masse suffisante pour faire fonction de masselotte; et

une partie de liaison (48) interconnectant lesdites première et deuxième parties.

**12.** Moteur selon la revendication 11, **caractérisé en ce que** lesdites première et deuxième parties sont pratiquement identiques.

**13.** Moteur selon la revendication 11, **caractérisé en ce que** ledit élément de commande de décompression pivote autour d'un axe de pivotement agencé entre lesdites première et deuxième parties.

**14.** Moteur selon la revendication 1, **caractérisé en ce que** l'axe de pivotement est agencé entre ledit rayon de base et ledit arbre à cames.

**15.** Moteur selon la revendication 1, **caractérisé en ce que** ladite came englobe une surface arrière supportant les forces de charge appliquées audit élément de commande de décompression par ledit galet suiveur, ledit élément de commande de décompression englobant une partie en U comportant une surface arrondie contactant ladite surface arrière pendant le pivotement de l'élément de commande de décompression par rapport à ladite came.

**16.** Moteur selon la revendication 13, **caractérisé en ce que** ledit élément de commande de décompression pivote entre une position engagée, dans laquelle ladite surface à came auxiliaire s'engage dans ledit galet de came en présence de vitesses de démarrage du moteur, et une position dégagée, dans laquelle ladite surface à came auxiliaire ne s'engage pas dans ledit galet suiveur, lesdites première et deuxième parties étant agencées radialement vers l'extérieur dudit axe de pivotement par rapport audit arbre à cames lorsque ledit élément de commande de décompression se trouve dans la position dégagée.

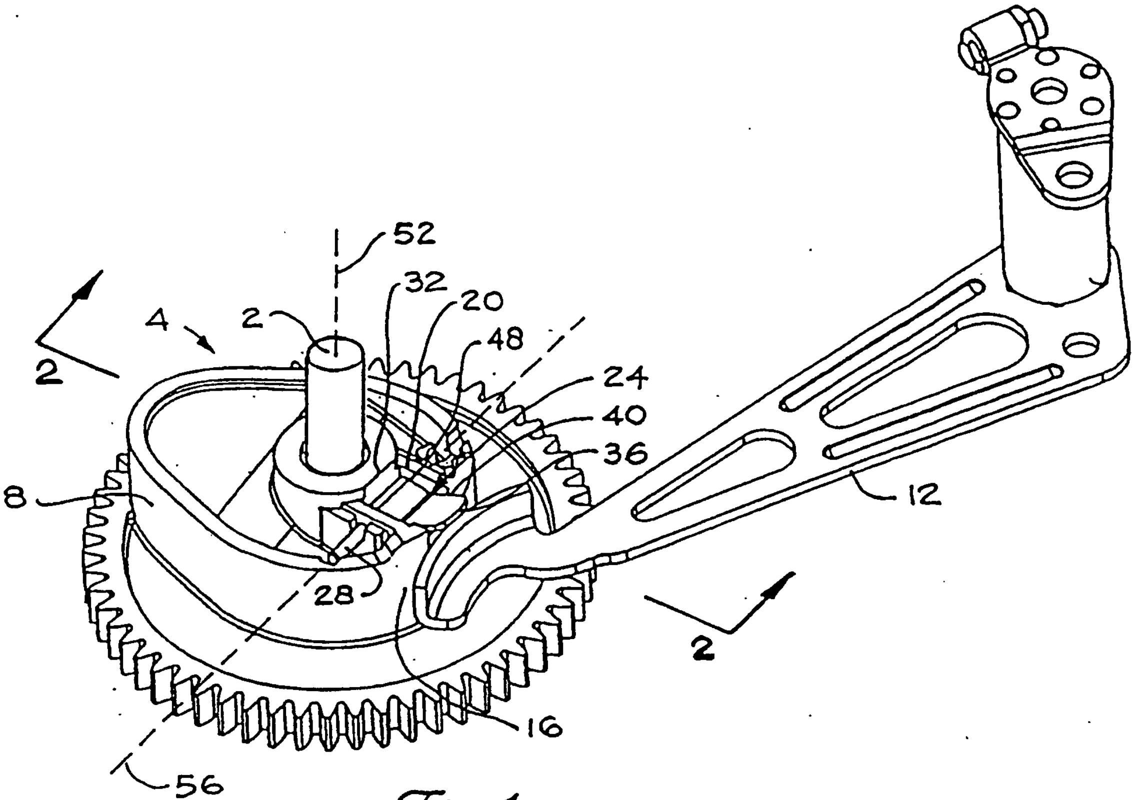
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Fig. 1

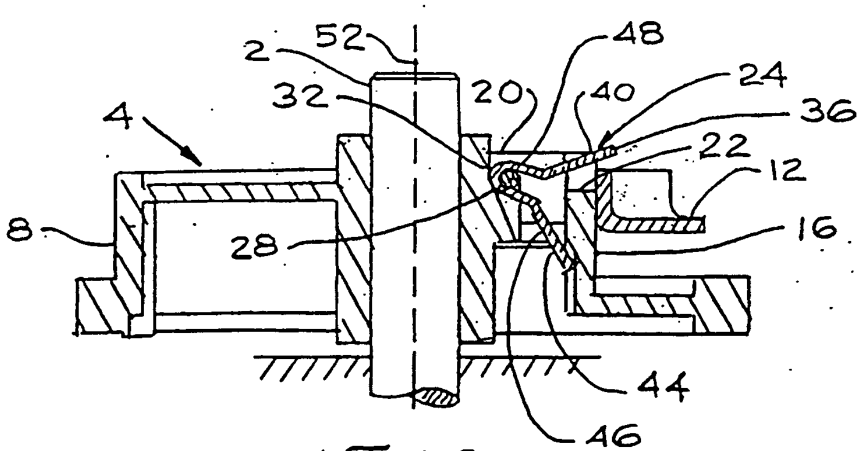
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Fig. 2

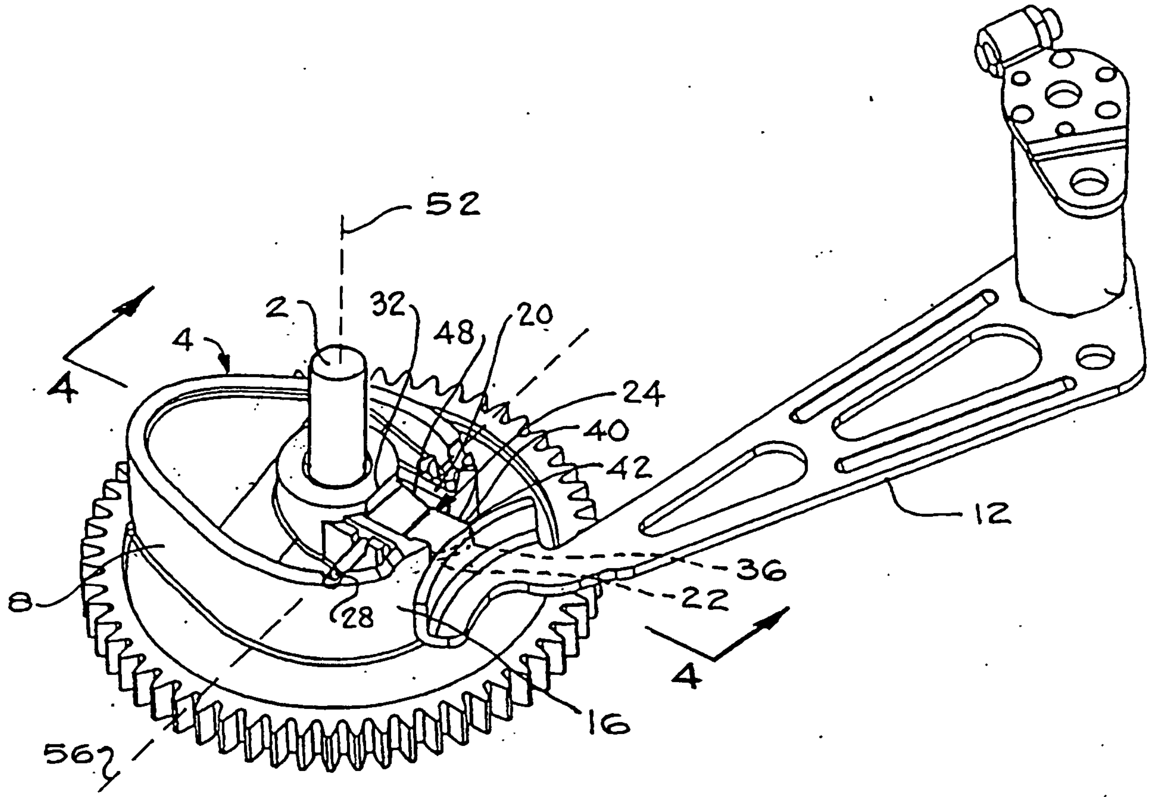
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Fig. 3

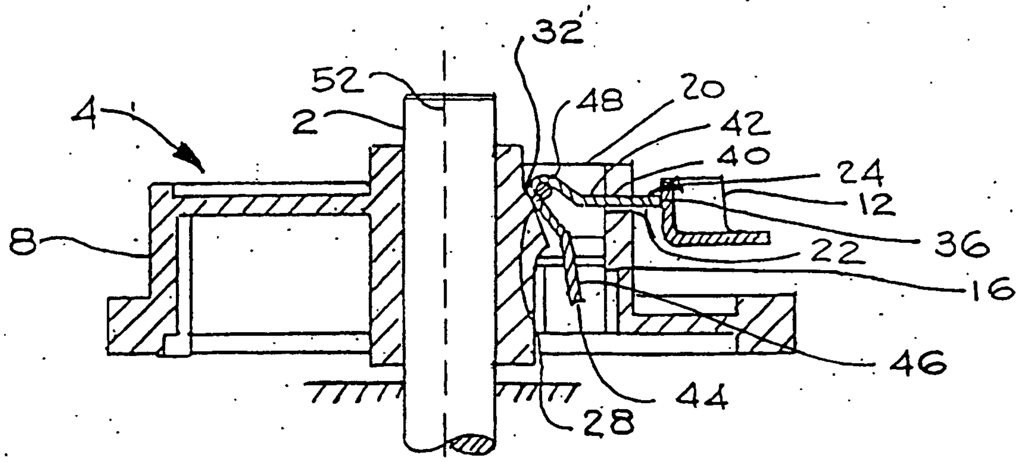
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Fig. 4

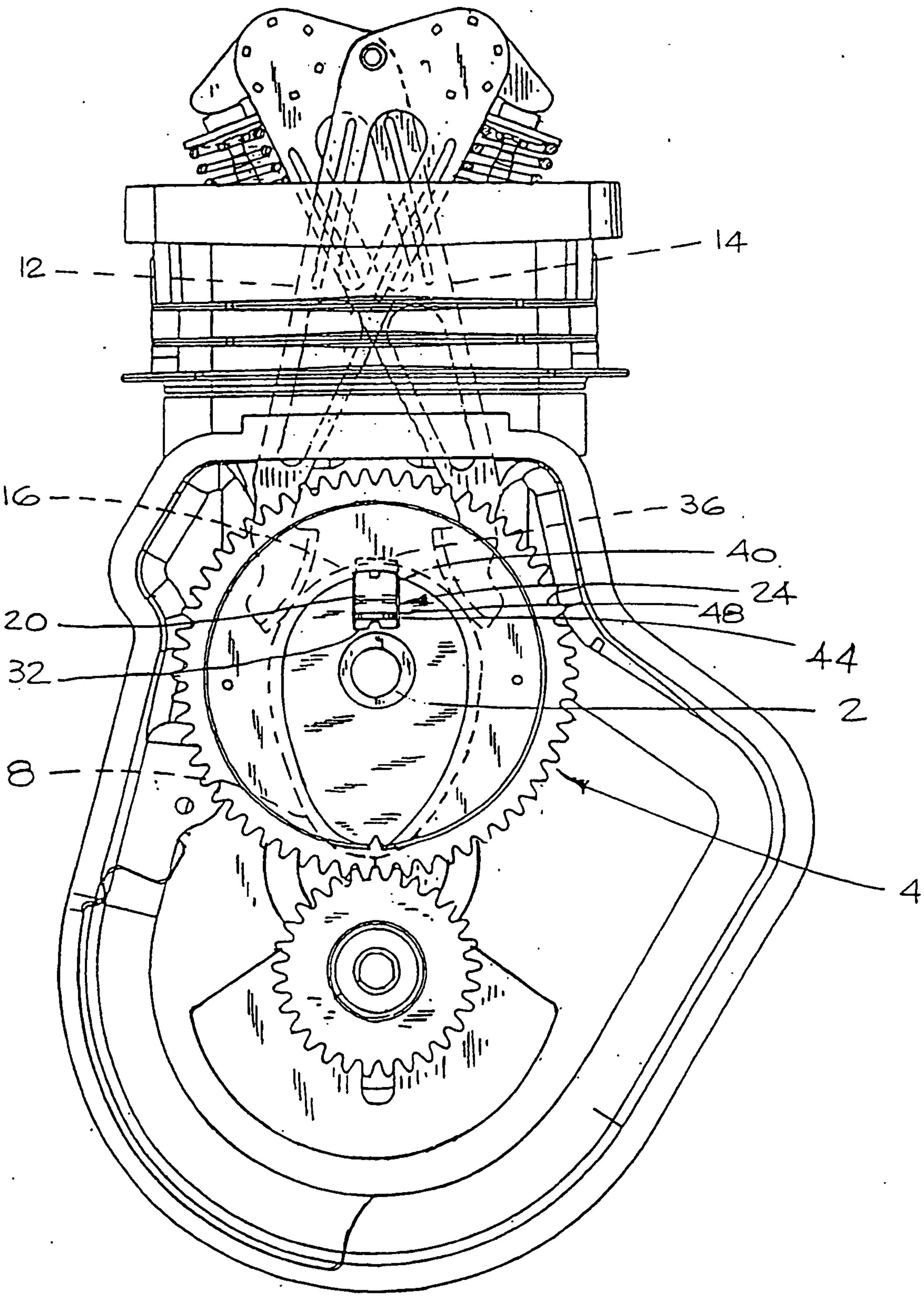


Fig. 5

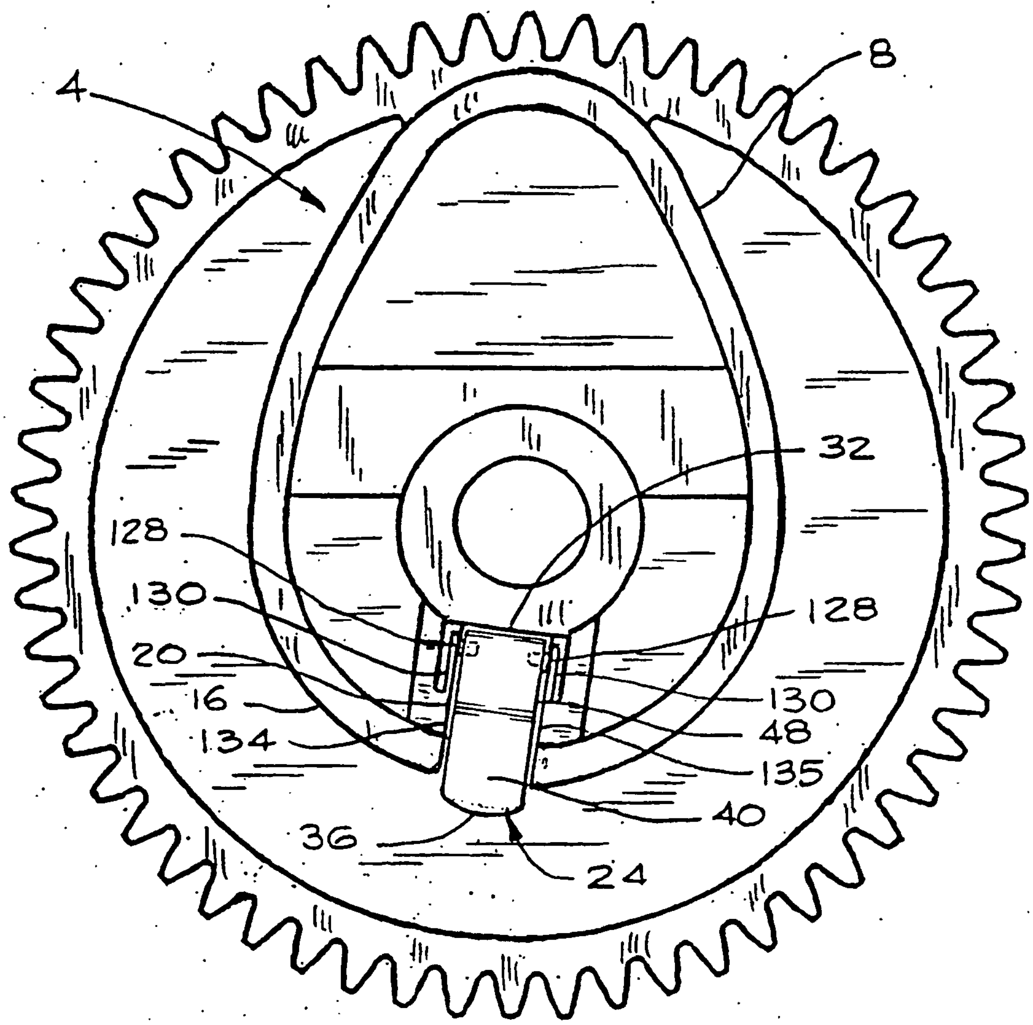


Fig. 6

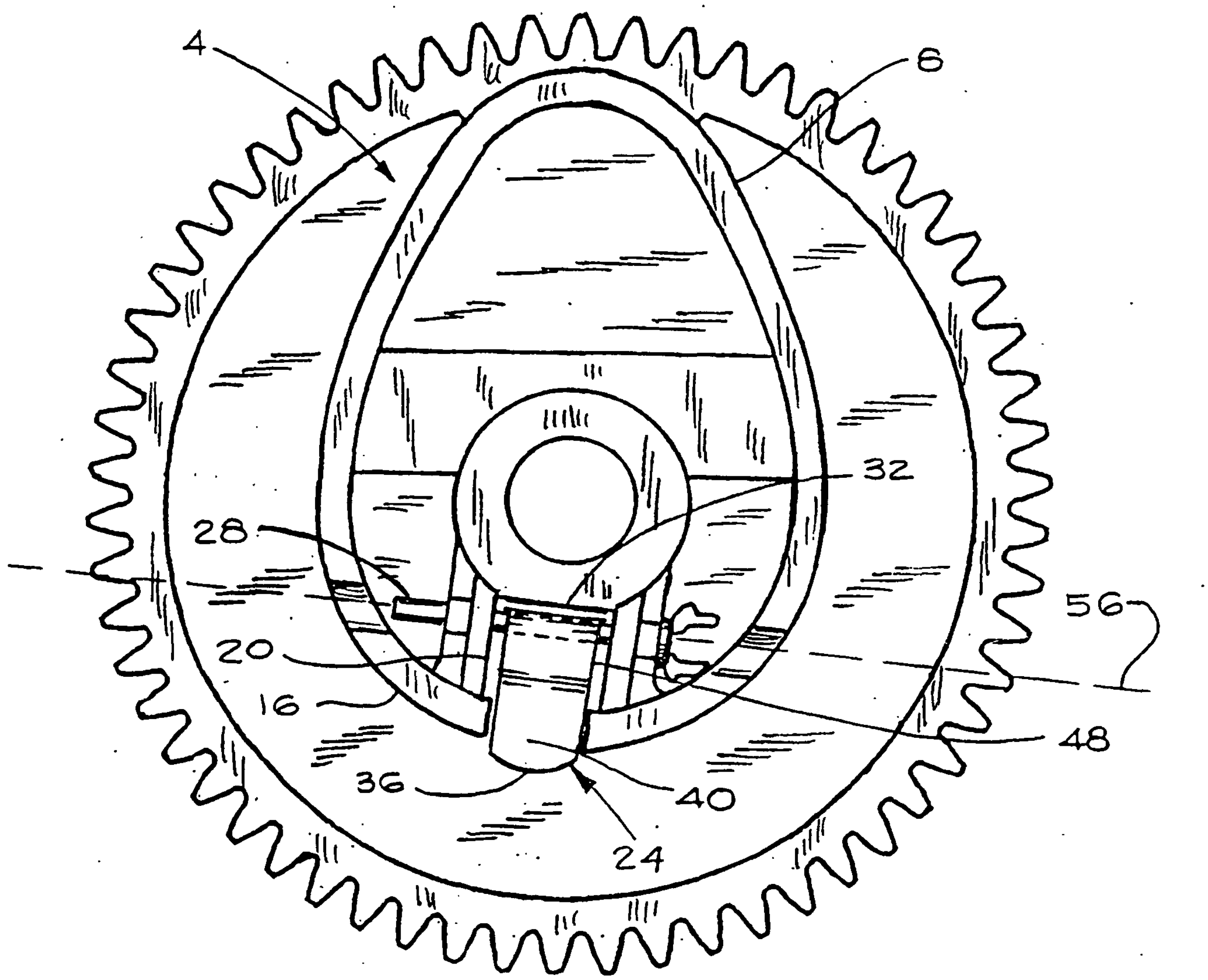


Fig. 7

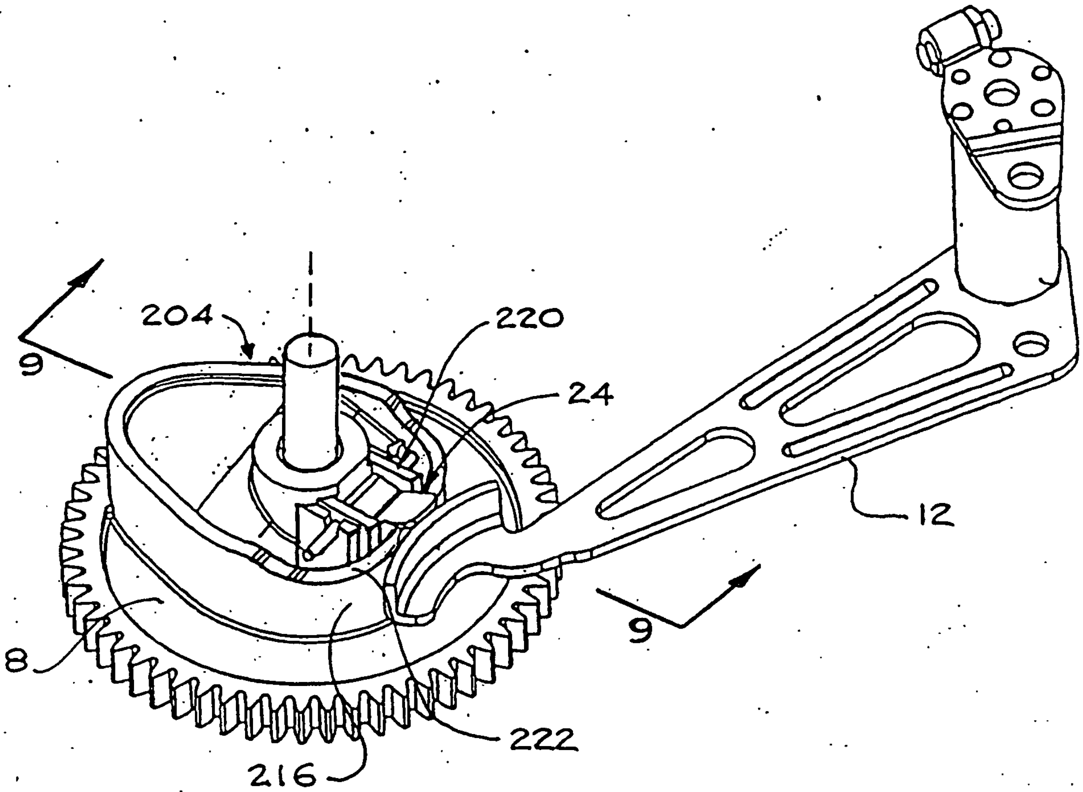


Fig. 8

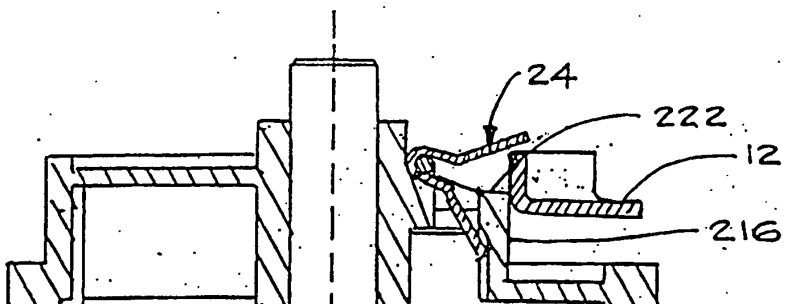


Fig. 9