July 31, 1962 E. BIEFANG 3,046,899

GENERATOR OR PUMP ASSEMBLY

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Fig. 1

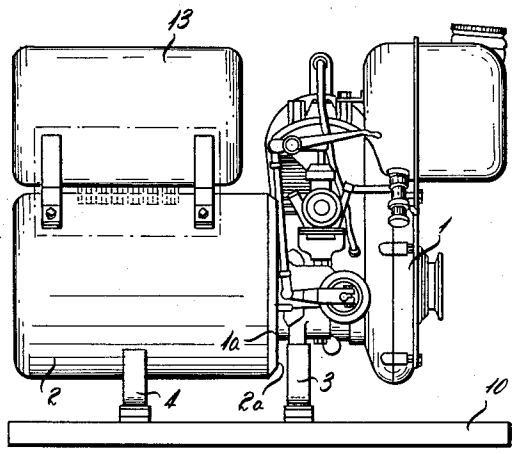
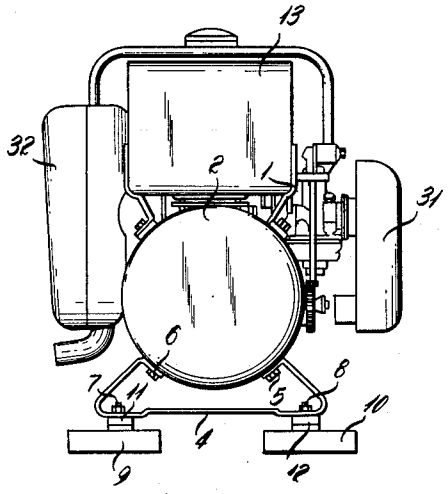


Fig. 2



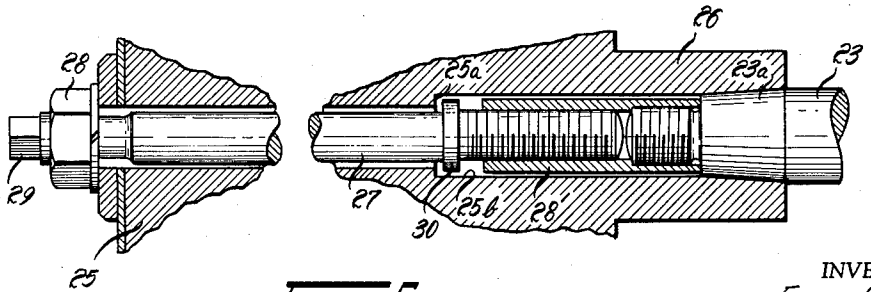


Fig. 3

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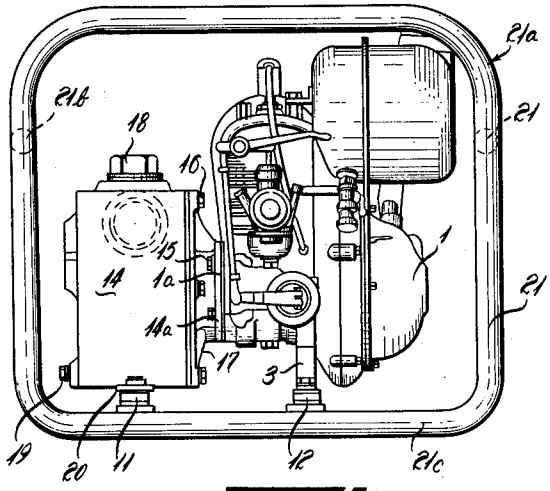


Fig. 3

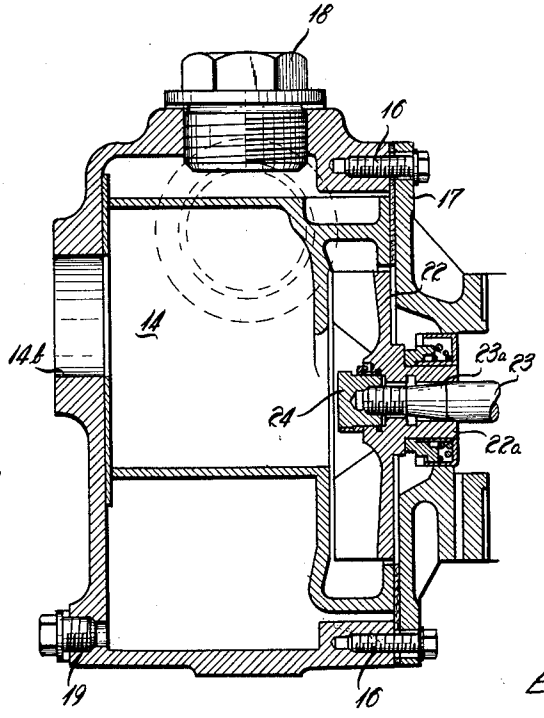


Fig. 4

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GENERATOR OR PUMP ASSEMBLY

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10 Claims. (Cl. 103—54)

The present invention relates to improvements in units comprising in combination an internal combustion engine and a driven rotor equipped unit or machine which for example may be a generator, pump, blower or the like. The invention has for its purpose to make such assemblies compact and space-saving, to render their operation silent and free from vibration, to simplify their structure, mounting and demounting and to facilitate their transportation. The unitary assemblies of this type heretofore known have utilized gas turbines as the prime mover, have provided a gear connection between the prime mover output shaft and the driven machine rotor and have rigidly mounted the prime mover and the driven unit on the supporting frame. United States Patent No. 2,780,174 issued February 7, 1957 to Wosika et al. is an example.

To fulfill the foregoing purpose, the invention proposes to rigidly connect the housing of the internal combustion engine to that of the driven machine, to arrange both housings each with separate resilient suspensions on a support common to both housings and to mount the rotor of the driven machine at least at one side directly on the crankshaft of the internal combustion engine. By the combination of these features the aspired purpose is obtained with very simple means, low costs and in a most effective manner, with the result that, according to the nature of the driven machine, the novel assembly is especially adapted as generator set, emergency power source, liquid pump, compressor, machine tool etc. for small-scale manufacturing, domestic and agricultural use and for application in emergency situations.

Preferably the brackets for positioning and cushioning the housings of the internal combustion engine and of the driven machine are resilient and without or with the aid of additional resilient means, and connected to their common support in spaced relation to each other. In this way the vibrations resulting from the operating parts of the assembly are largely isolated from the support and from the ground. In the same way the quietness of the assembly is materially increased.

The support itself may consist in simple sledges or trails e.g. of wood which are connected to each other and to the parts of the assembly only by the resilient brackets. This results in an especially light structure. The support can also be formed of a frame from metal tubes. In this case the lower or bottom beams of the frame can be used as skids, and its side and top beams act as protecting bars and as handles during the transportation of the assembly.

By directly mounting the rotor of the driven machine on one end of the crankshaft of the internal combustion engine at least one of the otherwise necessitated rotor bearings is eliminated. This structural simplification results in reduced purchase, manufacturing and mounting costs and easier mounting, servicing and demounting the assembly.

The foregoing and other objects of the present invention will become more fully apparent by reference to the appended claims and as the following detailed description proceeds in reference to the accompanying drawings, wherein:

FIGURE 1 is the side elevation of one embodiment of the invention in which the driven unit is a generator;

FIGURE 2 is the front view of an assembly of FIGURE 1;

FIGURE 3 is a side elevation of a second embodiment of the invention in which the driven unit is a pump;

FIGURE 4 is a fragmentary vertical section of the pump taken through its rotor axis; and

FIGURE 5 is a fragmentary sectional view of the assembly of FIGURE 1 taken through the generator rotor axis.

Referring to FIGURES 1 and 2, the left-hand end flange **1***a* of the housing of an internal combustion engine **1** directly abuts the right-hand end flange **2***a* of the housing of a generator **2**. The flanges **1***a* and **2***a* are rigidly connected to each other by bolts (not shown).

The housings of the engine **1** and generator **2** are resiliently supported by flat metal struts **3** and **4**. The struts **3** and **4** are bent in a somewhat triangular form (FIGURE 2), attached to the housings by bolts **5** and **6** at their free ends and bolted as at **7** and **8** to wooden sledges **9** and **10**. Rubber buffers **11** and **12** are preferably provided between the struts **3** and **4** and the sledges **9** and **10** but can be omitted when the resilience of the struts **3** and **4** is sufficient.

The generator housing has mounted on it a line voltage responsive switching device **13** which is operative at a predetermined low line voltage to connect the generator **2** to the line to operate as starting motor for the engine **1**. In this way the assembly is brought into action automatically. This self-operating switch and start device makes the unit especially suitable as an emergency power supply.

In the pump unit shown in FIGURES 3 and 4, the adjacent front flanges **14***a* and **1***a* of the housings of the pump **14** and engine **1** are likewise directly bolted to each other by bolts **15**. The bolts **16** connect the side cover **17** to the main pump housing. The pump housing is provided with connections **14***b* and **14***c* for the suction and delivery lines, with a primer stud **18** and with a drain plug **19**. The engine **1** is, as in the embodiment of FIGURES 1 and 2, supported by resilient struts **3** of the form shown in FIGURE 2. The pump housing has simple bearing lugs **20** integral with its housing which, by means of the resilient intermediate buffers **11**, rest on and are bolted to the frame **21***a* of the assembly.

The frame **21***a* of this assembly is composed of two parallel continuous tubular metal beams **21** which at their upper part are braced by cross beams **21***b* and at their lower part are connected to each other by the struts **3** of the engine **1** and by the bearing lugs **20** and the rigid pump housing. The lower longitudinal beams **21***c* of the frame **21***a* act as sledges during the displacement of the assembly, whereas the whole frame beams constitute a handle and protection bars for the assembly. The generator set shown in FIGURES 1 and 2 can likewise be mounted on a frame as shown in FIGURE 3 and conversely the simple sledges **9** and **10** of FIGURES 1 and 2 can be used for pump units or other assemblies.

In the assemblies according to the invention the rotor of the driven machine is directly mounted on one end of and preferably cantilever supported by the crankshaft of the internal combustion engine **1**. Thus, FIGURE 4 shows the bladed impeller **22** of the pump **14** directly mounted on and, by means of the nut **24**, fixed to the tapered end **23***a* of the crankshaft **23**. An additional bearing for the impeller **22** within the pump housing is not necessary. The hub **22***a* of the impeller **22** is externally sealed in fluid tight relation to side cover **17** in an appropriate manner at its passage in the cover **17** and internally sealed in fluid tight relation to the crankshaft **23** as shown to prevent entrance of fluid being pumped into the housing of engine **1**.

As is shown in FIGURE 5, in the embodiment of FIGURES 1 and 2 the end **23***a* of the crankshaft **23** is

inserted into the hub 26 of the ventilator wheel (not shown) fixed to the rotor 25 of the generator 2. The rotor 25 is clamped to the crankshaft 23 by means of a tension rod 27 and nut 28. The tension rod 27 is screwed into the threaded bushing 28' which in turn is screwed on to the threaded end projection of the shaft end 23. It is provided with a square 29 at its free end and with an integral collar 30 on its shaft adjacent the end of its threaded portion.

By means of a wrench engaging the square 29, the tension rod 27 is screwed into and out of the bushing 28'. In screwing the rod 27 out of the bushing 28' the collar 30 of the rod 27 abuts the recessed face 25*a* of the rotor bore 25*b* and thus draws the rotor off from the shaft 23. In this way the tension rod 27 can be used also as a puller screw. The collar 30 may be arranged in such a manner that, in tightening, the rod 27 is locked against the bushing 28'.

Whereas the invention is shown in the drawings only as applied to a generator or pump assembly, it is, of course, applicable in an analogous way to any other unit consisting of an internal combustion engine and a rotor equipped driven machine. The invention includes also those embodiments wherein such machine is a blower, circular saw, winch or the like. The internal combustion engine 1 should be provided in any case with intake and exhaust silencers 31 and 32 respectively in order to decrease the noise of the assembly and to increase the potential uses of it. The silencers are preferably designed in the kind of that type which is known by the designation "System Dr. Leistritz."

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A unitary assembly comprising an internal combustion engine having a housing and a crankshaft, a rotor equipped driven power output machine having a housing, means directly mounting and supporting said driven machine rotor on said engine crankshaft for concomitant rotation therewith, said crank shaft constituting the sole support for said driven machine rotor at the end of said driven machine rotor adjacent said engine, means directly and rigidly connecting said engine housing to said driven machine housing, a base, and means resiliently and independently mounting each of said housings on said base.

2. The combination defined in claim 1 wherein the resilient mounting means for at least one of said housings comprises an elongated metallic strip bent transversely to provide a generally triangular configuration, the base of said strip being fixed to said base and the upwardly extending legs thereof being fixed to said one housing at their upper ends.

3. The combination defined in claim 2 wherein said resilient mounting means further comprises an elastic shock absorbing pad interposed between said strip base and said base.

4. The combination defined in claim 1 wherein said driven machine rotor is cantilever supported at one end of said crankshaft.

5. The combination defined in claim 1 wherein said driven machine is an electrical generator.

6. The combination defined in claim 1 wherein said driven machine is a centrifugal pump.

7. The combination defined in claim 1 wherein said base is a pair of spaced parallel trails connected together solely by said resilient mounting means.

8. The combination defined in claim 1 wherein said base comprises a pair of spaced parallel hollow frames each formed of an endless hollow tube having rectilinear parallel top and bottom portions interconnected by upstanding side portions, the spacing between said top and bottom portions being greater than the height of either said engine or said driven machine and the spacing between said side portions being greater than the combined length of said driven machine and said engine whereby the assembly of said engine and said driven machine is surrounded by said base for protective purposes.

9. A unitary assembly comprising an internal combustion engine having a housing and a crankshaft, a rotor equipped driven power output machine having a housing with said crankshaft being arranged to extend into said housing of said driven machine, means directly mounting and supporting said driven machine rotor on said crankshaft, said crankshaft constituting the sole support for said driven machine rotor at the end of said driven machine rotor adjacent said engine, means for abuttingly and rigidly connecting said engine housing to said driven machine housing to form a unitary rigid unit, a rigid support base for said engine and said driven machine, and first and second spaced apart resilient support brackets respectively and individually connected to said driven machine housing and said engine housing for supporting said driven machine and said engine on said base in spaced apart relationship thereto, said first and second support brackets constituting the sole support for said driven machine and said engine and being arranged relative to the housings of said driven machine and said engine to singly provide a cantilever support for said driven machine and said engine as a unit.

10. A unitary assembly comprising an internal combustion engine having a housing and a crankshaft, a rotor equipped driven power output machine having a housing with said crankshaft being arranged to extend into said housing of said driven machine, means directly mounting and supporting said driven machine rotor on said crankshaft, said crankshaft constituting the sole support for said driven machine rotor at the end of said driven machine rotor adjacent said engine, means for abuttingly and rigidly connecting said engine housing to said driven machine housing to form a unitary rigid unit, a rigid support base for said engine and said driven machine, and first and second spaced apart resilient support brackets respectively and individually connected to said driven machine housing and said engine housing for supporting said driven machine and said engine on said base in spaced apart relationship thereto, said first and second support brackets constituting the sole support for said driven machine and said engine and each being formed with an elongated metallic strip bent transversely to provide a generally triangular configuration with a central portion fixed to said base and with legs extending upwardly from opposite ends of said central portion, said legs being fixed at their upper ends the ones of said housings associated therewith.

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