March 14, 1950 R. E. LAMBERTON 2,500,366

COMPRESSOR

Filed April 9, 1946 5 Sheets-Sheet 1

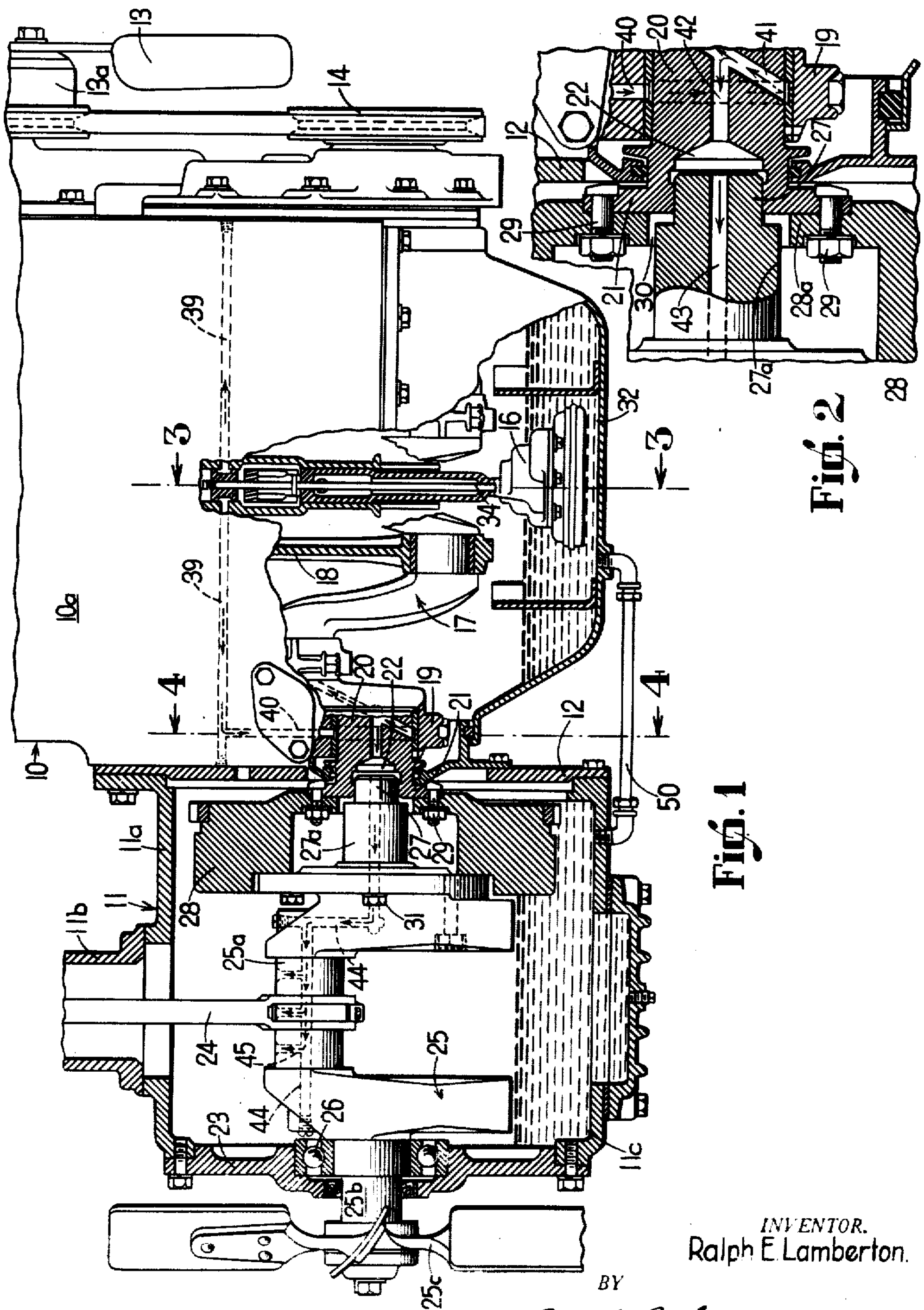

Fig. 1

Fig. 2

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COMPRESSOR

2,500,366

Filed April 9, 1946

5 Sheets-Sheet 2

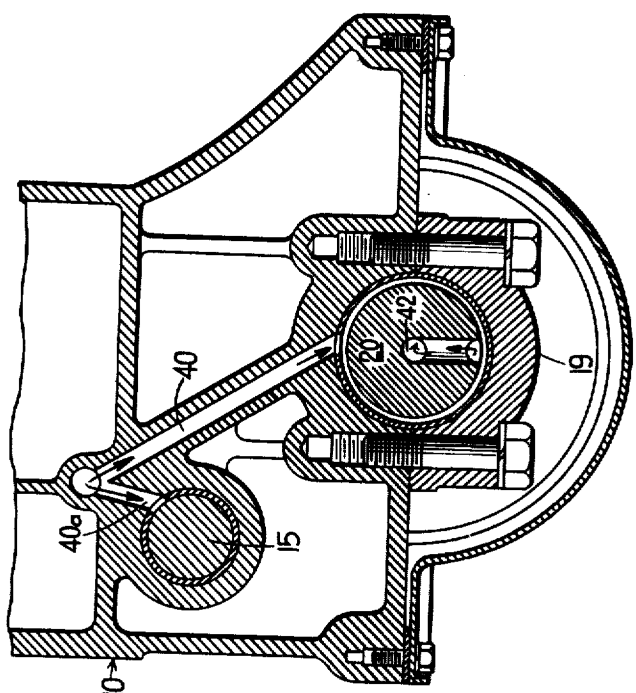

Fig. 4

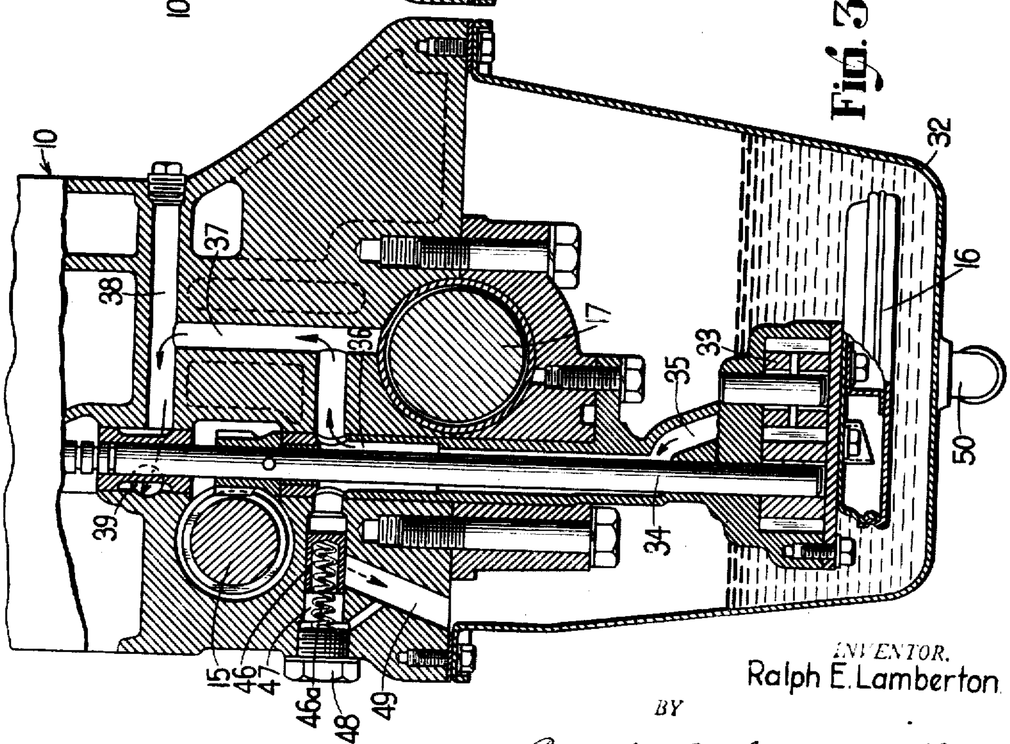

Fig. 3

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COMPRESSOR

Filed April 9, 1946 5 Sheets-Sheet 3

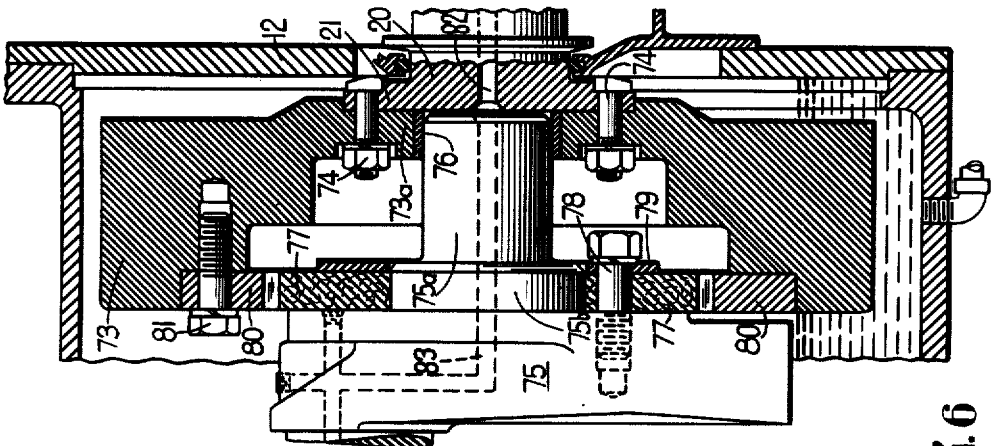

Fig. 6

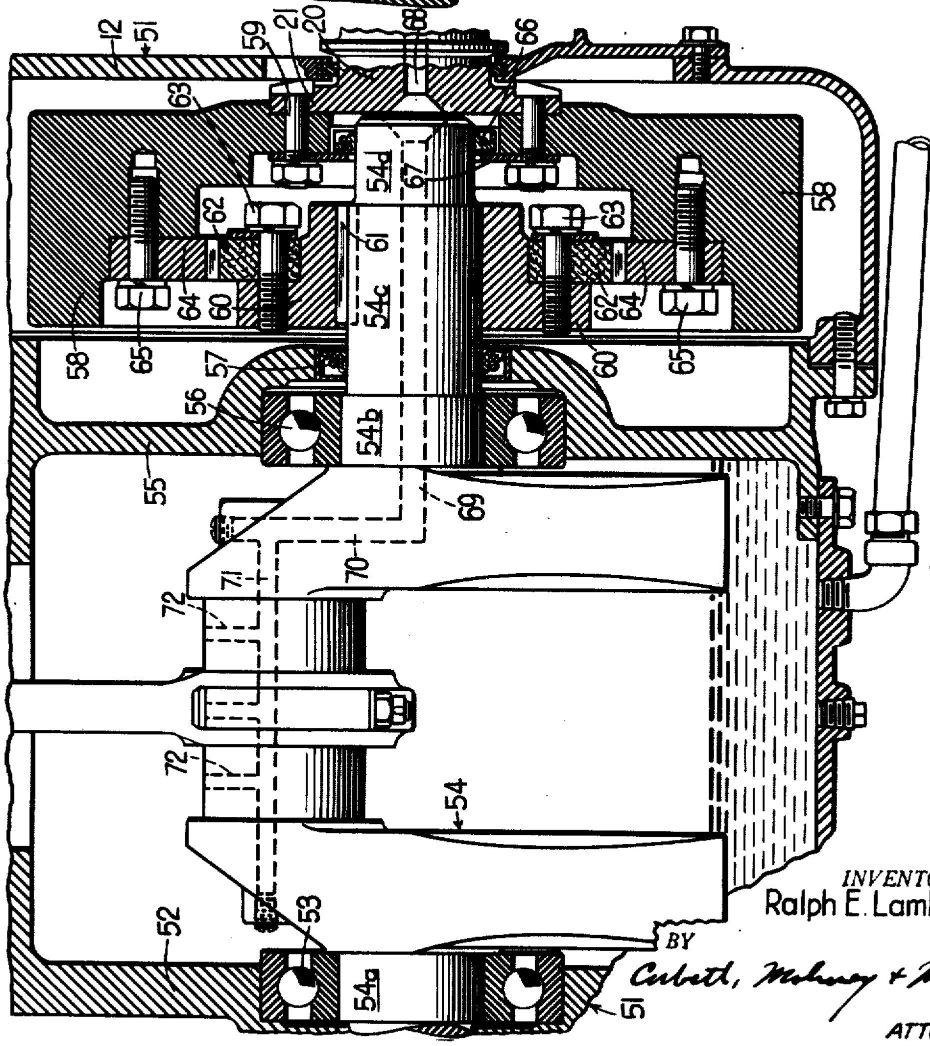

Fig. 5

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2,500,366

Filed April 9, 1946

5 Sheets-Sheet 4

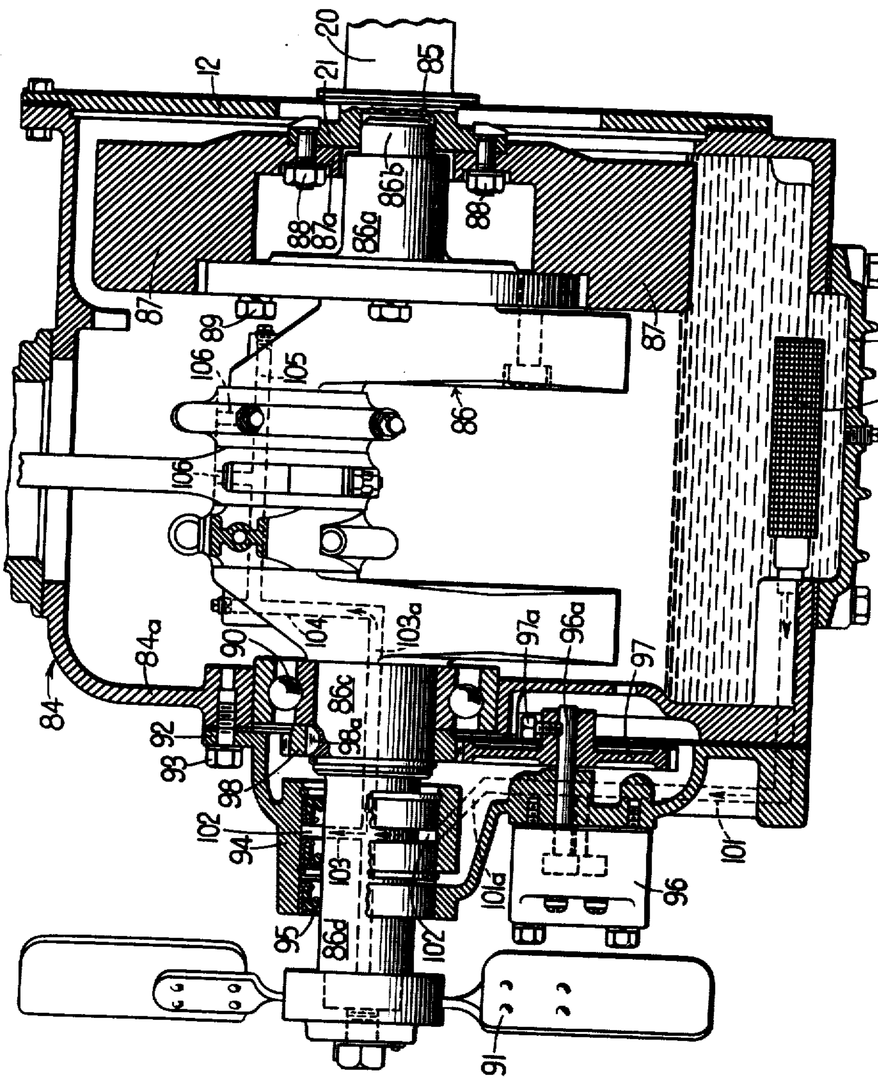

Fig. 7

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March 14, 1950 R. E. LAMBERTON 2,500,366

COMPRESSOR

Filed April 9, 1946 5 Sheets-Sheet 5

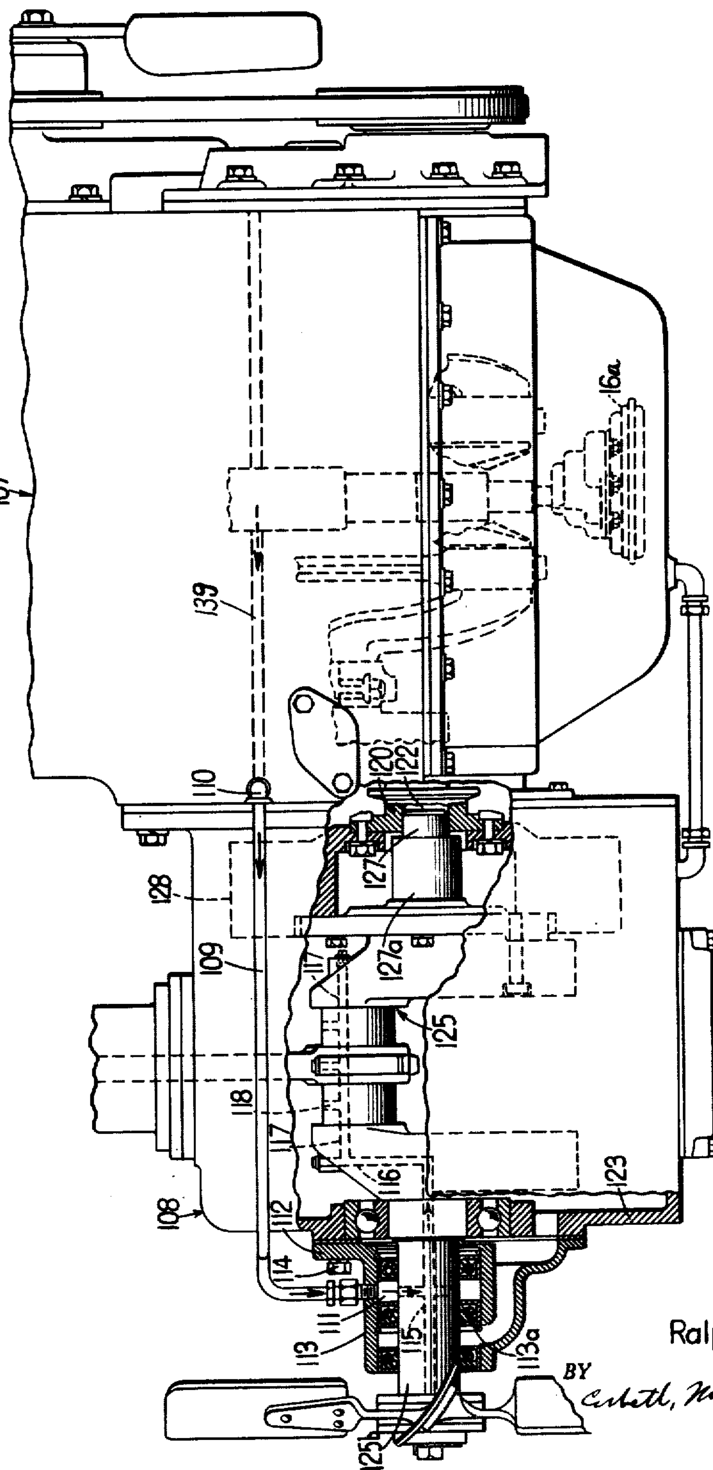

Fig. 8

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Patented Mar. 14, 1950

2,500,366

UNITED STATES PATENT OFFICE

2,500,366

COMPRESSOR

Ralph E. Lamberton, Columbus, Ohio, assignor to The Jaeger Machine Company, Columbus, Ohio, a corporation of Ohio

Application April 9, 1946, Serial No. 660,656

16 Claims. (Cl. 230—206)

1

The present invention relates to compressors. It has to do particularly, although not exclusively, with a compressor structure in which an internal combustion engine unit and a compressor unit are arranged in a compact structure and in tandem relationship, wherein the casings or housings for both units preferably have a common dividing wall, and wherein improved means is provided for supplying lubricant under pressure to the drive and driven shafts and to their driving connection.

An object to the present invention is to provide a compressor structure of relatively compact nature and one in which the construction is simplified to thereby reduce the cost of manufacture.

A further object of the present invention is to provide a compressor structure wherein the drive shaft of the engine and the driven shaft of the compressor are connected together as a unit in such a manner as to provide a satisfactory driving connection; another object being to provide a structure wherein one of the shafts serves as a support for the adjacent end of the other shaft.

A further object of the present invention is to provide a compressor structure of the foregoing character wherein the adjacent ends of the drive and driven shafts interfit, and wherein a flywheel is interposed between the shafts, carried by one thereof, and maintained out of contact with the adjacent end portion of the other shaft.

Another object of the present invention is to provide a compressor structure of the foregoing character wherein means is provided for supplying lubricant under pressure from one of the shafts to the other of the shafts and permitting the use of the force feed lubricating system of one unit to supply lubricant to both units.

A further object of the present invention is to provide a compressor structure having an internal combustion unit and a compressor unit arranged in tandem relationship, in which the crank shafts of both units are arranged in cooperative relationship, and wherein lubricant under pressure supplied to one of said crankshafts is conducted thereby to the other of said crankshafts to lubricate the same.

A further object of the present invention is to provide a compressor structure comprising an internal combustion engine unit and a compressor unit arranged in tandem relationship, with the drive shaft of the engine unit interfitting with the driven shaft of the compressor unit, and wherein a flywheel is carried by the drive shaft and maintained out of contact with the adjacent end of the driven shaft.

2

Another object of the present invention is to provide a power shaft for imparting power to another shaft, in which the adjacent ends of the shafts have interfitting portions providing a driving connection between the shafts, and wherein means is provided for supplying lubricant under pressure to one of the shafts which conducts it to the other shaft.

The foregoing and other objects and advantages of the present invention will appear from the following description and appended claims when considered in connection with the accompanying drawings wherein like reference characters designate corresponding parts in the several views.

In said drawings:

Fig. 1 is a fragmentary longitudinal sectional view, partly in elevation and partly broken away, of one form of compressor structure or power plant embodying the present invention.

Fig. 2 is an enlarged fragmentary detail sectional view, of the driving connection between the drive and driven shafts of the compressor structure of Fig. 1.

Fig. 3 is an enlarged fragmentary vertical sectional view, taken substantially along the line 3—3 of Fig. 1, looking in the direction of the arrows.

Fig. 4 is an enlarged fragmentary vertical sectional view taken substantially along the line 4—4 of Fig. 1, looking in the direction of the arrows.

Fig. 5 is a fragmentary vertical sectional view through a modified form of compressor unit and driving connection between said unit and an adjacent internal combustion engine unit.

Fig. 6 is a fragmentary vertical sectional view showing a further modified form of driving connection between a compressor unit and an internal combustion engine unit embodying the present invention.

Fig. 7 is a vertical longitudinal sectional view of a somewhat further modified form of the present invention wherein a separate lubricating system is provided for the compressor unit; and

Fig. 8 is a fragmentary side elevational view, partly broken away, and partly in section, illustrating another embodiment of compressor structure in accordance with the present invention.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. It is to be understood also that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention herein claimed beyond the requirements of the prior art.

Generally speaking, the present invention relates to a compressor structure or outfit in which an internal combustion engine unit, having a casing or housing and a compressor unit, also having a casing or housing, are arranged in side-by-side or tandem relationship and with the two casings, as shown, having a common dividing wall or partition. As shown, the internal combustion engine has a crankshaft or drive shaft which, in accordance with most of the forms of the present invention, has a socket or recess formed in its inner end adjacent the compressor unit. The crankshaft or driven shaft of the compressor unit has at its inner end adjacent the internal combustion engine unit, a projecting end portion of reduced cross section which is adapted to interfit with the socket or recess formed in the adjacent end of the drive shaft, thus providing a driven connection between the two shafts, with the drive shaft also providing means for supporting the adjacent end of the driven shaft, thus eliminating the necessity of providing a supporting bearing for the inner end of the driven shaft, as seen particularly in Figs. 1, 2, 7 and 8 of the drawings.

The inner end of the drive shaft, namely the crankshaft of the internal combustion engine unit is preferably flanged and serves to support a flywheel whose adjacent or hub portion is preferably bolted to the flange. Thus, the drive shaft serves to support the flywheel which is entirely out of contact with the adjacent inner end portion of the driven shaft. The only means of connection between the crankshaft or driven shaft of the compressor unit and the flywheel comprises spaced bolts which clamp or hold portions of the driven crankshaft assembly which are remote from the reduced inner end of the driven shaft, to the adjacent face of the flywheel. The purpose of so connecting the crankshaft and flywheel is to provide the driving connection for the structure.

Improved means have been provided for supplying lubricant under pressure from the usual force feed system of the internal combustion engine unit, to the driving connection between the drive and driven shafts and also to the driven shaft and associated parts of the compressor unit. In accordance with a modified form of the invention, a separate pump or system for supplying lubricant may be provided for each of the units; whereas, in accordance with another modification of the invention, external means may be provided for conducting or conveying lubricant under pressure from the lubricating system of the internal combustion engine unit to the driven shaft of the compressor unit. Various other novel features and details of the compressor structure embodying the present invention will appear in the description to follow.

Referring now particularly to Figs. 1 to 4, inclusive, of the drawings, there is shown in these figures one embodiment of the structure of the present invention which is directed to the connection between the drive and driven shafts whereby one shaft serves as a support for the other shaft, and to the improved means for lubricating the shafts and the driving connection between them.

In Fig. 1 the compressor structure includes an

internal combustion engine unit, shown as a whole at 10 and a compressor unit, shown as a whole at 11. Each unit is provided with its own casing or housing 10*a* and 11*a*, respectively, and the two units are so arranged in end-to-end or tandem relationship as to permit, if desired, of the use of a common dividing wall or partition, such as that shown as a whole at 12. The internal combustion engine unit includes the usual water cooling system and a fan 13, the fan being mounted upon a hub 13*a* which is belt-connected to a pulley 14 mounted upon the engine crankshaft 17. The engine unit 10 is also provided, as shown, with a gear type oil pump 16 for the purpose of supplying oil under pressure to the working or moving parts of the engine assembly. The engine has a crankshaft or drive shaft, shown as a whole at 17 to which a plurality of pistons (not shown) are connected by means of connecting rods, one such being shown at 18 in Fig. 1. The crankshaft 17 is mounted in main bearings, such as that shown at 19, Fig. 1 in the usual manner and its inner end portion 20 is preferably extended to project through an opening in the wall or partition 12 and into the interior of the compressor casing. The end portion 20 of the crankshaft is provided with an annular flange 21 and is machined to provide a socket or recess 22, see particularly Fig. 2.

The compressor unit 11, as stated above, has a housing or casing and a removable end wall 23 disposed opposite the common wall or partition 12. As shown, the compressor comprises a cylinder 11*b* within which is located a piston (not shown) carried by a connecting rod 24 mounted upon a pin 25*a* of the compressor crankshaft, or driven shaft, shown as a whole at 25.

The end wall 23 carries an anti-friction bearing 26 for the outer end of the driven shaft 25. No such bearing is provided at the opposite or inner end of the driven shaft 25 but this shaft is provided, as shown, with a reduced inner end portion 27 which interfits with the socket 22 of drive shaft 17 and thus provides a driving connection between the two shafts, with the drive shaft portion 20 serving as the means for supporting the adjacent end of the driven shaft 25, as clearly seen in Figs. 1 and 2.

The compressor unit 11 also includes a flywheel 28 whose hub portion 28*a* is preferably bolted to the drive shaft flange 21 by bolts or the like 29. It is to be noted particularly that neither of the portions 27 and 27*a* of the driven shaft is in contact with the flywheel 28, and that the hub portion 28*a* of the flywheel is spaced from the driven shaft to provide a clearance 30 at all times, see especially Fig. 2.

It is to be noted further that the only connection between the flywheel 28 and the crankshaft or driven shaft assembly 25 is afforded by means of the connecting bolts 31, see Fig. 1. The means for connecting a portion of the driven shaft assembly 25 with portions of the flywheel 28 provides a driving connection for the structure. It is to be distinctly understood that the flywheel 28 does not provide a support for the driven shaft 25, said shaft being supported at its outer end by the bearing 26 and at its inner or opposite end, by the crankshaft or drive portion 20 of the internal combustion engine unit.

It is, of course, particularly desirable to provide a compressor structure, such as that embodied in the present invention, with force feed means for lubricating its various working parts. For this purpose, and in accordance with the present invention, the oil pump 16 of the internal combustion engine unit 10 is utilized to lubricate, not only the working parts of the engine unit, but also the working parts of the adjacent compressor unit 11.

The pump 16 is of the conventional gear type commonly used in internal combustion engines and is, as shown, located within the sump or oil pan 32 of the engine unit 10. The pump 16 has the usual gearing, indicated generally at 33, which is preferably driven from the cam shaft 15 through the medium of a geared shaft 34. The oil is delivered by the pump through suitable passageways 35, 36, 37 and 38 to a main oil gallery 39, see Figs. 1, 3 and 4. This main oil gallery 39 consists of two branches as shown in broken lines in Fig. 1, these branches extending outwardly in opposite directions from the vicinity of the upper end of the pump drive shaft 34.

The main oil gallery 39 is connected with a sub-gallery 40, as shown in broken lines, Fig. 1 and in full lines, Fig. 4. The sub-gallery or passageway 40 supplies oil in the direction of the arrows to the bearing 19 from whence it flows through a bore or passageway 41 into an axially drilled passageway or bore 42 formed in the inner end portion 20 of the engine drive shaft 17. Oil is also fed from the main gallery 39 through another sub-gallery 40*a* to the cam shaft 15, see Fig. 4.

Oil from the passageway or bore 42 enters the socket or recess 22 formed in the inner end of the drive shaft 17 and will thence pass through a longitudinal passage 43 formed in the adjacent end portions 27 and 27*a* of the compressor driven shaft. The crankshaft or driven shaft 25 of the compressor is provided with drilled connected passageways 44 and 45, see Fig. 1, so that the entire driven shaft assembly 25 of the compressor unit 11, as well as the entire drive shaft assembly 17 of the internal combustion engine unit, is lubricated by force-fed oil supplied by the pump 16.

As seen in Fig. 3, the lubricating system for the engine unit is provided with a spring pressed relief valve 46 located in a bore 47 formed in the engine block, the valve and its spring 46*a* being concealed by a removable threaded cap 48. The valve 46 normally closes a relief passageway 49 formed in the engine block which passageway communicates with the sump or oil pan 32. When pressure in the oil system becomes too great and exerts a pressure above a predetermined amount upon the head of valve 46, the strength of spring 46*a* is overcome and the pressure in the system relieved by the valve permitting oil to flow to and through the discharge passageway 49, back into pan 32.

As seen in Fig. 1, the sump or oil pan 32 of the engine unit 10 is connected with the crankcase or oil pan 11*c* of the compressor unit 11, by a pipeline 50. By virtue of this connection, the oil level in the members 32 and 11*c* is the same.

In accordance with the foregoing, it will be appreciated that oil under pressure is supplied to the working parts of the compressor unit 11 by the pump 16 of the engine unit 10, the oil being directed from the passageway 42 in the drive shaft portion 20 of the engine to a similar passageway 43 formed in the driven shaft of the compressor unit.

As seen in Fig. 1, the outer end portion of the driven shaft 25 projects at 25*b* beyond the end wall 23 of the compressor casing and has mounted upon it a conventional cooling fan 25*c*.

In Fig. 5 of the drawings there is shown a variation or modification of the present invention. In this form, wherein only the compressor unit is illustrated, said unit is indicated as a whole at 51. It is to be understood that the internal combustion engine unit (of which only a fragment of the end portion 20 of the crankshaft or drive shaft is shown) is substantially the same as the engine unit 10 illustrated in Fig. 1 and that both units in the present form of Fig. 5 are preferably lubricated by oil under pressure which is supplied from a conventional gear or other type pump of the engine unit (not shown). As seen in Fig. 5, the outer end wall 52 supports a ball bearing assembly 53 for receiving and supporting the end portion 54*a* of a crankshaft or driven shaft, shown as a whole at 54. The housing or casing of the unit 51 is provided with a partition or web-like wall 55 carrying a second ball bearing assembly 56 in which the inner portion 54*b* of the driven shaft is journalled. The partition 55 also serves to support an oil seal 57 which surrounds the portion 54*c* of the driven shaft. The extreme inner end portion of the driven shaft 54 is of further reduced cross section, as seen at 54*d*. It will be noted that the shaft portion 54*d* terminates adjacent and in close proximity to the adjacent end portion 20 of the engine drive shaft.

The portion 20 of the engine driven shaft which extends through an opening in the common dividing wall or partition 12, is provided with a surrounding flange 21 to which a flywheel is bolted by means of bolts 59. The flywheel is located between the web-like partition 55 and the dividing wall 12.

The portion 54*c* of the driven shaft carries an annular hub member 60 which, as shown, is keyed to the shaft portion by a key or pin 61. The member 60 carries on its outer face an external ring-like driven fiber gear 62 which, as shown, is held to the member 60 by bolts or the like 63. The flywheel 58 carries a driving internal metal ring gear 64 which is held in place upon the flywheel by bolts or cap screws 65. The teeth of the two gears are intermeshed. Thus, rotation of the flywheel 58 by the drive shaft of the internal combustion engine imparts rotation to the driven shaft 54 through the intermeshing gears 64 and 62. While the gear 62 has been referred to as being made from fiber, it will be understood that this gear may be formed from various other non-metallic materials; or, if desired, it may be a metal gear. The purpose of providing a non-metallic gear in mesh with a metal gear, such as is shown in Fig. 5, is to provide more silent operation of the structure.

The reduced end portion 54*d* of the driven shaft is provided with an oil seal 66 which is preferably held in place by a ring-like member 67. It will be understood that oil under pressure from the engine oil pump (now shown) will pass from the oil passageway 68 in the portion 20 of the engine drive shaft to the space between the two shafts and will enter the bore or passageway 69 formed in the portions 54*b*, 54*c* and 54*d* of the driven shaft. This bore or passageway 69 is in communication with additional passageways 70, 71 and 72 which feed or direct oil under pressure to the moving parts of the compressor unit driven shaft 54. Thus, it will be seen that the oil feed in the present form of the invention is substantially the same as that in the preceding form but that the drive, instead of being direct from the engine unit drive shaft to the compressor unit driven shaft, as in Fig. 1, the drive in Fig. 5 is indirect and from the engine drive shaft portion 20, through the flywheel 58, driving and driven gears 64 and 62, and hub member 60, to the driven shaft 54 of the compressor unit 51.

In Fig. 6 of the drawings there is shown a further modification of the present invention. In this form, wherein only fragments of the compressor unit driven shaft and of the internal combustion engine unit drive shaft, together with the flywheel structure are shown, the end portion 20 of the engine drive shaft has the usual surrounding flange 21 to which is bolted a flywheel 73 by means of bolts or the like 74. The compressor unit crankshaft or driven shaft is shown as a whole at 75 and has an inner end portion 75a which terminates near the end of portion 20 of the engine drive shaft and which extends into an opening formed by the hub portion 73a of the flywheel. A metal bushing, such as a brass bushing 76, is preferably interposed between the hub portion 73a and the driven shaft portion 75a. The driven shaft 75 also has a portion 75b of somewhat larger diameter than the portion 75a. This portion 75b carries a driven external fiber gear member 77 which is preferably held in place upon the portion 75b and the driven crankshaft 75 by bolts, one of which is shown at 78, and a ring-like member 79. The flywheel carries a driving internal metal gear member 80 which is held in place upon the flywheel by bolts or cap screws, one of which is shown at 81. If desired, the bushing 76 may be eliminated.

Lubricant is supplied to the driven shaft 75 in substantially the same manner as in the structure of Fig. 5, the internal combustion engine unit oil pump (not shown) being employed to feed oil to the drive shaft bore or passageway 82 from which it enters a similar passageway 83 in the driven shaft 75 to lubricate the moving parts of the compressor unit. As in the form of Fig. 5, the drive is indirect as distinguished from the direct drive of Fig. 1. In the present instance, the drive shaft of the engine, of which only the end portion 20 is shown, drives the flywheel 73 and through the driving internal gear member 80 and the driven external fiber gear member 77, drives the driven shaft 75 of the compressor unit. The fiber or non-metallic gear member 77 provides for more silent operation of the parts.

In accordance with a further modified form of the present invention, the compressor structure comprises the two units, namely the internal combustion engine unit and the compressor unit, in which each of the units has its own lubricating system, including an oil pump. In Fig. 7 of the drawings only the compressor unit 84 is shown and it is to be understood that the internal combustion engine unit (not shown) is the same, or substantially the same as that shown in Fig. 1 of the drawings and previously described. The two units are provided with their usual casings or housings and are preferably separated by a common dividing wall or partition 12 like that of the preceding forms of the invention. As in Fig. 1, the internal combustion engine unit drive shaft portion 20 is provided with a socket or recess 85 which receives the reduced inner end portion 86b of the crankshaft or driven shaft 86 of the compressor unit 84. Also as in the form of Fig. 1, the engine drive shaft portion 20 is flanged at 21 and a flywheel 87 is bolted to the flange by means of bolts or the like 88. As clearly shown, the hub portion 87a of the flywheel is spaced from and therefore entirely out of contact with, the driven shaft portions 86a and 86b. The only connection between the driven shaft 86 and the flywheel 87 is the bolts or the like 89, which serve to connect portions of the driven crankshaft 86 which are remote from the shaft portions 86a and 86b, with said flywheel.

As stated above, the compressor unit 84, in accordance with the present form of the invention, has its own lubricating system and oil pump. The outer wall 84a of the compressor casing or housing carries a ball bearing assembly 90 in which the portion 86c of the driven crankshaft is journalled. The shaft is extended outwardly beyond portion 86c and is of somewhat reduced cross-section, as shown at 86d. Mounted upon the end of the shaft portion 86d is a cooling fan 91.

The wall 84a of the compressor casing is provided with a removable end cover and pump supporting member 92. The cover 92 is held to the casing in any suitable manner, as by means of bolts or cap screws, one such being shown at 93. The cover 92 has a hollow boss 94 through which the driven shaft portion or extension 86d projects. A plurality of spaced oil seals 95 serves to seal the space between the shaft portion 86d and the boss 94 and thus prevent the escape of oil from the unit.

A conventional oil pump 96 is mounted, as shown, upon the cover 92. The pump shaft 96a carries a gear 97 held to the shaft by a pin or bolt 97a. The gear 97 meshes with an external ring gear 98 which is keyed at 98a to the driven shaft portion 86c. Thus, it will be seen that the pump 96 is driven by the driven crankshaft 86 of the compressor unit. Lubricant is pumped from the crankcase or oil pan 99 through a strainer or filter 100 and passageway 101 to the pump 96 and from the pump through passageway 101a to the annular space 102. It flows from space 102 through passageways 103 and 103a to additional connected passageways 104, 105 and 106 in the crankshaft or driven shaft 86. Thus, oil under pressure is supplied by the pump 96 to all of the working parts of the compressor unit, it being understood that the working parts of the internal combustion engine unit (not shown) are also being supplied with oil under pressure by a separate pump which forms a part of that unit.

Referring now particularly to Fig. 8 of the drawings, the compressor structure shown therein is substantially like that shown in Fig. 1 and fully described above. In accordance with the present form of the invention, however, oil under pressure which is supplied by the pump 16a in the internal combustion engine unit 107, is fed to the compressor unit 108 by an externally disposed pipe line or conduit 109. The pipe line 109 is preferably tapped into the internal combustion engine unit casing at 110 and preferably into the main oil gallery 139. The pipe line 109 conducts oil under pressure to the forward or outer end portion of the crankshaft or driven shaft 125 of the compressor unit, the oil entering a space 111 between the driven shaft portion 125b and an annular hollow boss 113 formed in the cover 112. This cover, as shown, is bolted at 114 to the end wall 123 of the compressor unit 108. The space 111 contains a plurality of spaced oil seals 113a and is in communication with a longitudinal bore or passageway 115 in the shaft portion 125b. This passageway 115 communicates with passageways 116, 117 and 118 formed in the driven crankshaft 125.

It is to be noted that in the form of the invention shown in Fig. 8, the inner end portion 127 of the driven shaft fits into a machined socket 122 formed in the adjacent end portion 120 of the drive shaft of the internal combustion engine unit 107. It is also to be noted that the driven shaft portion 127a is spaced from and therefore entirely out of contact with the hub of a flywheel 128. Thus, it will be understood, that the inner end of the compressor unit driven shaft is supported by the adjacent inner end portion 120 of the drive shaft of the internal combustion engine unit 107. It will also be understood that the working parts of the internal combustion engine unit 107 are supplied with oil by means of the pump 16a of that unit.

From the foregoing it will be seen that I have provided a new and novel compressor structure in several forms of which the driven shaft of the compressor unit is supported at its inner end by the adjacent end portion of the driven shaft of the internal combustion engine unit, in which forms the drive from the engine unit to the compressor unit is direct through the interconnected drive and driven shafts. It will also be seen that I have provided a novel means for supplying lubricating oil under pressure to the working parts of a compressor unit by means of the pump and oiling system provided in the internal combustion engine unit. Moreover, in accordance with certain forms of the invention, oil is supplied to the compressor unit by the pump and oiling system of the internal combustion engine unit, in which forms the drive from the drive shaft of the internal combustion engine unit to the driven shaft of the compressor unit is indirect, or through suitable internal and external cooperating ring gears and a flywheel which form part of the structure.

I claim:

1. In a structure of the type described, the combination of an internal combustion engine unit and a compressor unit, said engine unit having a drive shaft and said compressor unit having a cooperating driven shaft, a flywheel associated with the drive and driven shafts, one of said shafts having a socket formed in its inner end portion and the other of said shafts having an end portion fitting within the socket and providing a driving connection between the shafts, means for connecting the flywheel to the drive shaft, and separate means for connecting another portion of the flywheel remote from the driving connection to the driven shaft.

2. Structure according to claim 1, wherein common lubricating means is provided for supplying lubricant to both of said shafts.

3. In a structure of the character described, in combination, an internal combustion engine unit and a compressor unit arranged in tandem relationship, said engine and compressor units having separate housings provided with a common intermediate wall disposed between the units, said engine unit having a drive shaft and said compressor unit having a driven shaft, a flywheel associated with the drive and driven shafts, means for connecting the flywheel to the drive shaft, and separate means for connecting another portion of the flywheel to the driven shaft, said drive shaft having a socket formed in an end thereof, said driven shaft having an end portion fitting within said socket providing means for drivingly connecting the shafts together and also providing means whereby one of said shafts is supported by the other of said shafts independently of said flywheel.

4. A structure of the character described, comprising an internal combustion engine unit and a compressor unit, separate housing for said units having a common dividing wall, said engine unit having a drive shaft and said compressor unit having a driven shaft, a flywheel associated with said shafts, means connecting the flywheel to the drive shaft, separate means connecting another portion of the flywheel to the driven shaft, and means for drivingly connecting the shafts together and for supporting one thereof from the other thereof, said last named means comprising interfitting cooperable portions of said shafts, one shaft having a socket and the other shaft having an adjacent end portion fitting within said socket.

5. A structure of the character described comprising a drive shaft and a driven shaft rotatably supported in axial alignment with their adjacent ends closely associated, a flywheel disposed at the adjacent ends of said shafts, means for securing the flywheel directly to the end of the drive shaft, said flywheel being provided with a centrally disposed opening in axial alignment with the drive shaft and within which the end of the driven shaft is disposed, and separate means independent of said first means surrounding said driven shaft and disposed between it and the periphery of the flywheel for drivingly connecting the driven shaft to the flywheel, said last-named means being non-rotatably secured to the driven shaft and being attached to the flywheel at a point remote from its axis.

6. A structure of the character described comprising a drive shaft and a driven shaft rotatably supported in axial alignment with their adjacent ends closely associated, a flywheel disposed at the adjacent ends of said shafts, said flywheel being provided with a centrally disposed opening in axial alignment with the drive shaft and within which the end of the driven shaft is disposed, a flange on the end of said drive shaft engaging the flywheel around said opening and being secured thereto by clamping bolts passing through adjacent portions of said flange and said flywheel, said flywheel also having a chamber formed therein at the side towards the driven shaft into which the driven shaft extends and is centrally located relative to the rim of the flywheel, separate means independent of said first means for drivingly connecting the driven shaft to the rim of the flywheel, said last-named means including a member surrounding said driven shaft and disposed in said chamber between said driven shaft and the rim of the flywheel and being non-rotatably secured to the driven shaft, and means for fastening said member to said flywheel comprising clamping bolts passing through said member adjacent its peripheral edge into said flywheel at points remote from the axis of said flywheel.

7. A structure of the character described comprising a drive shaft and a driven shaft rotatably supported in axial alignment with their adjacent ends closely associated, a flywheel disposed at the adjacent ends of said shafts, said flywheel being provided with a centrally disposed opening in axial alignment with the drive shaft and within which the end of the driven shaft is disposed, one of said shafts having a socket formed in its end and the other of said shafts having a cooperating portion fitting within the socket and providing means for supporting one of the shafts from the other shaft, and means surrounding said driven shaft and disposed between it and the

periphery of the flywheel for drivingly connecting the driven shaft to the flywheel.

8. A structure of the character described comprising a drive shaft and a driven shaft rotatably supported in axial alignment with their adjacent ends closely associated, a flywheel disposed at the adjacent ends of said shaft, said flywheel being provided with a centrally disposed opening in axial alignment with the drive shaft and within which the end of the driven shaft is disposed, a flange on the end of said drive shaft engaging the flywheel around said opening and being secured thereto, said driven shaft having a portion formed on the end thereof which projects through said opening, the end of the drive shaft having a socket formed therein and into which said portion of the driven shaft projects so that the end of the driven shaft is supported by the end of the drive shaft, said flywheel also having a chamber formed therein at the side towards the driven shaft through which the driven shaft extends and is centrally located relative to the rim of the flywheel, and means surrounding said driven shaft and disposed within said chamber between said shaft and the rim of the flywheel for drivingly connecting the driven shaft to the rim of the flywheel.

9. A structure according to claim 8 wherein said last-named means comprises a disc non-rotatably carried by said driven shaft and having its peripheral edge secured to the rim of said flywheel.

10. A structure according to claim 6 wherein said last-named means comprises an external gear disposed in said chamber in surrounding relationship to said driven shaft and being non-rotatably carried by the driven shaft and an internal gear carried by the rim of the flywheel which intermesh with each other.

11. A structure according to claim 10 wherein said driven shaft is supported by a bearing disposed adjacent said flywheel.

12. A structure according to claim 10 where one

of said gears is metallic and the other is non-metallic.

13. A structure according to claim 12 wherein said opening in the flywheel is provided with a bearing in which said driven shaft fits.

14. A structure of the character described comprising a drive shaft and a driven shaft rotatably supported in axial alignment with their adjacent ends closely associated, a flywheel disposed at the adjacent ends of said shafts, means for securing the flywheel directly to the end of the drive shaft, said flywheel being provided with a centrally disposed opening in axial alignment with the drive shaft, said opening being provided with a bearing within which the end of the driven shaft is disposed and is supported, and means surrounding said driven shaft and disposed between it and the periphery of the flywheel for drivingly connecting the driven shaft to the flywheel.

15. A structure according to claim 14 wherein said last-named means comprises intermeshing gears carried by the driven shaft and the flywheel.

16. A structure according to claim 14 wherein said last-named means comprises an external gear carried by the driven shaft and an internal ring gear carried by the flywheel.

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