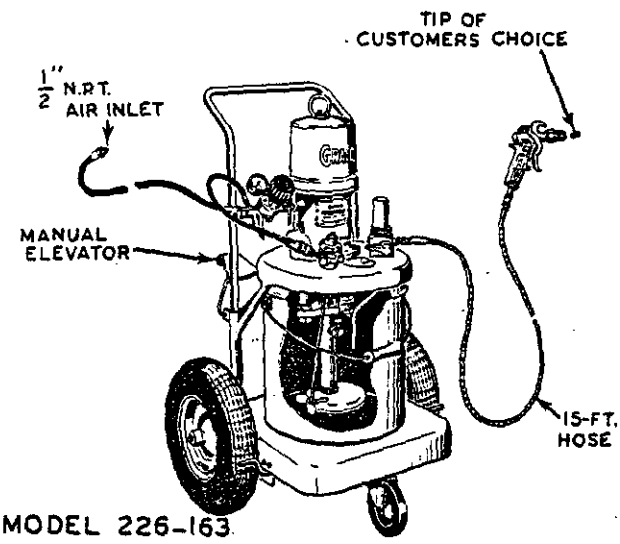
INSTRUCTIONS
AND PARTS LIST

FORM: 306-704
PUBLISHED: 1-61

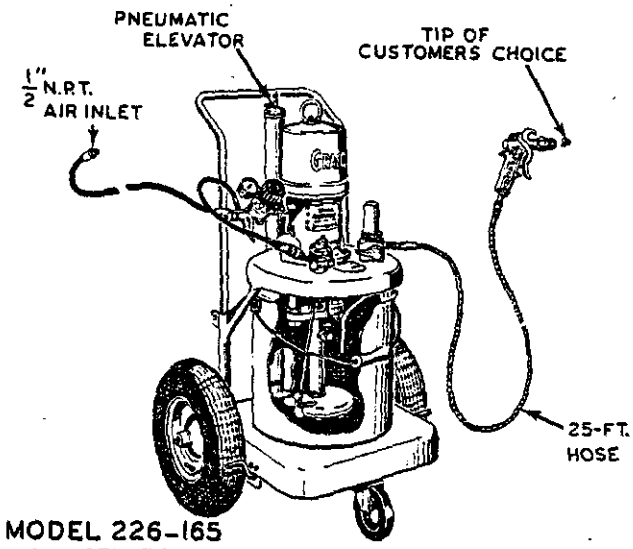
GRACO

10 GALLON PRESIDENT HYDRA-SPRAY UNITS

STATIONARY MODEL	PORTABLE MODELS		
LESS WHEELS AND BRAKE WITH MANUAL ELEVATOR	WITH MANUAL ELEVATOR	WITH PNEUMATIC ELEVATOR	
226-161 SERIES "A" HAS MANIFOLD WITH DUMP VALVE	226-163 SERIES "A" HAS MANIFOLD WITH DUMP VALVE	226-165 SERIES "A" HAS FILTER WITH DUMP VALVE	226-167 SERIES "A" HAS FILTER WITH DUMP VALVE AND SURGE TANK



MODEL 226-163 ILLUSTRATED



MODEL 226-165 ILLUSTRATED

DESCRIPTION

These Hydra-Spray Units apply light materials by utilizing HIGH HYDRAULIC PRESSURE THROUGH A SMALL FLUID ORIFICE. The combination of high fluid pressure and small orifice creates fine material breakup without atomizing air. This airless spraying system without heat was originally pioneered and developed by Graco engineers to improve the consistency and lower the costs of coating applications. The portable, truck-mounted Hydra-Spray units wheel directly to the work, wherever the job site...in-plant or outside, on rough terrain or in a remote area. Works direct from original 1 to 10 gallon containers. Provides fast color changing for short run work, quick mobility for constant one-color application.

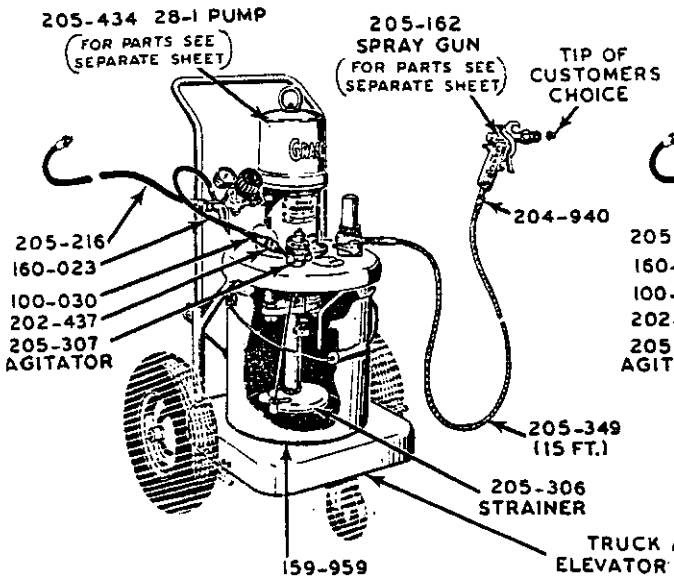
Units utilize air pressure to (1) operate the pump which powers the transfer of material to the spray tip, (2) drive the agitator that thoroughly mixes and keeps material solids in sprayable suspension and (3) power the pneumatic elevator, of Models 226-165 and 226-167, for fast, easy material container changing. No air used to atomize the material...no pressure on container...no possible aeration of material. Special, air-powered, reciprocating type pump provides continuous-duty action, with equal pressure and volume delivery on both strokes. Pump develops material pressure 28 times greater than the inbound air pressure. (For example: at 60 PSI inbound air, the pump develops 1680 PSI material pressure.)

Units are designed for high volume, production-type spraying of protective coating paints and similar light materials, providing a heavy, one coat application with almost complete elimination of overspray. All units are equipped with a material outlet manifold having a valve for recirculating material or dumping sludge. Also manifold has an extra material outlet for addition of a second spray gun. Models 226-165 and 226-167 include a filter kit, shipped loose, which can be easily installed in manifold to filter the material. Also Model 226-167 includes a surge tank, shipped loose, that can be easily assembled to manifold to eliminate material surge. NOTE: A tungsten carbide spray tip of customers choice is included in all units. The proper spray tip to be used for a specific material should be determined by a test conducted by your local Graco Industrial Distributor or by his recommendation from previous experience with the same or similar material.

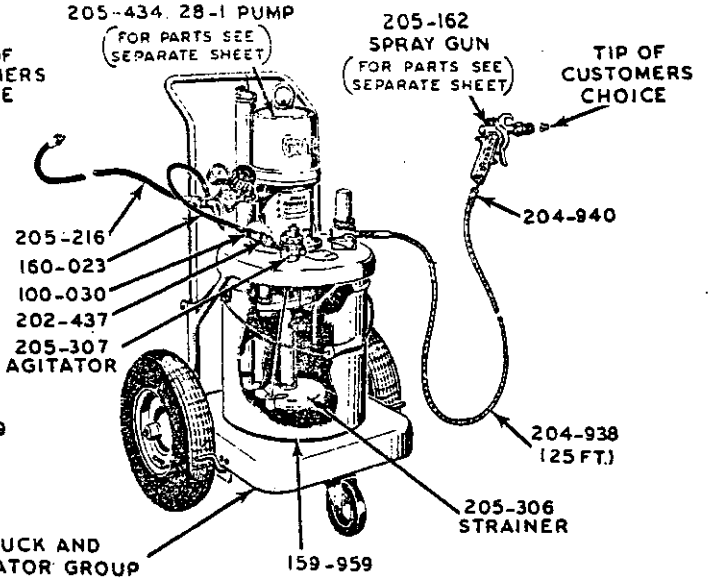
RETAIN FOR FUTURE REFERENCE

• MINNEAPOLIS 13, MINN.

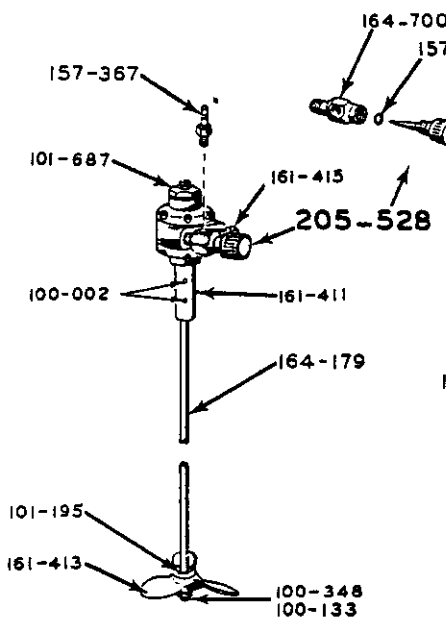
Factory Branches: NEW YORK (Long Island City), PHILADELPHIA, DETROIT, CHICAGO, ATLANTA, SAN FRANCISCO, HOUSTON



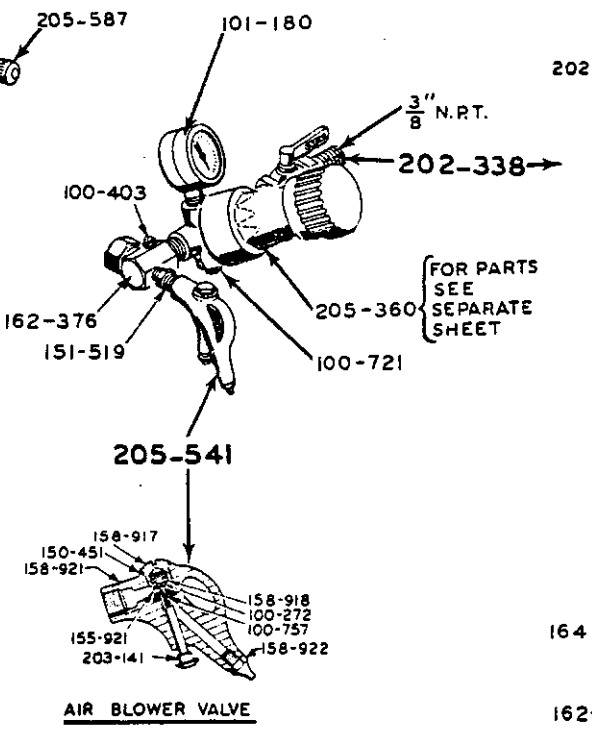
MODEL 226-161 SERIES "A"
(STATIONARY LESS WHEELS AND BRAKE)
MODEL 226-163 SERIES "A"
(WITH MANUAL ELEVATOR)



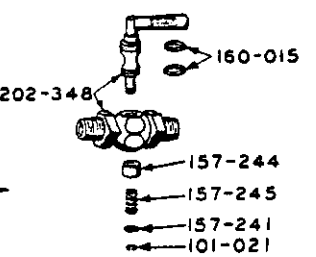
MODEL 226-165 SERIES "A"
MODEL 226-167 SERIES "A"
(WITH PNEUMATIC ELEVATOR)



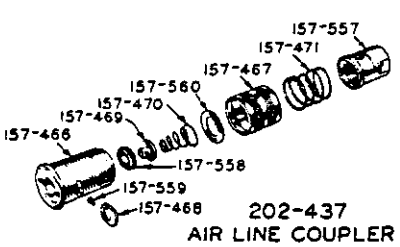
205-307
AGITATOR



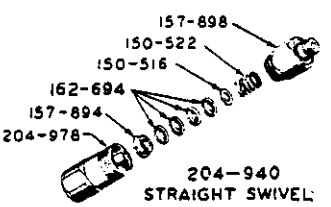
AIR BLOWER VALVE



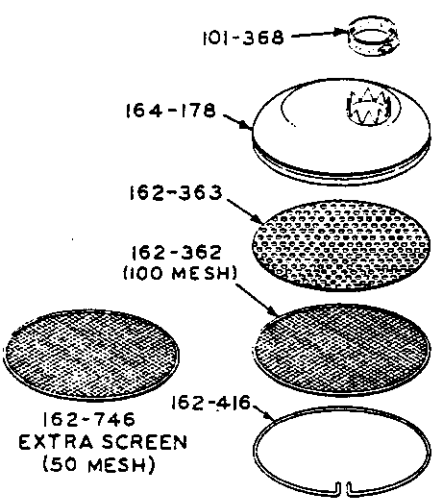
202-338
AIR LINE PETCOCK



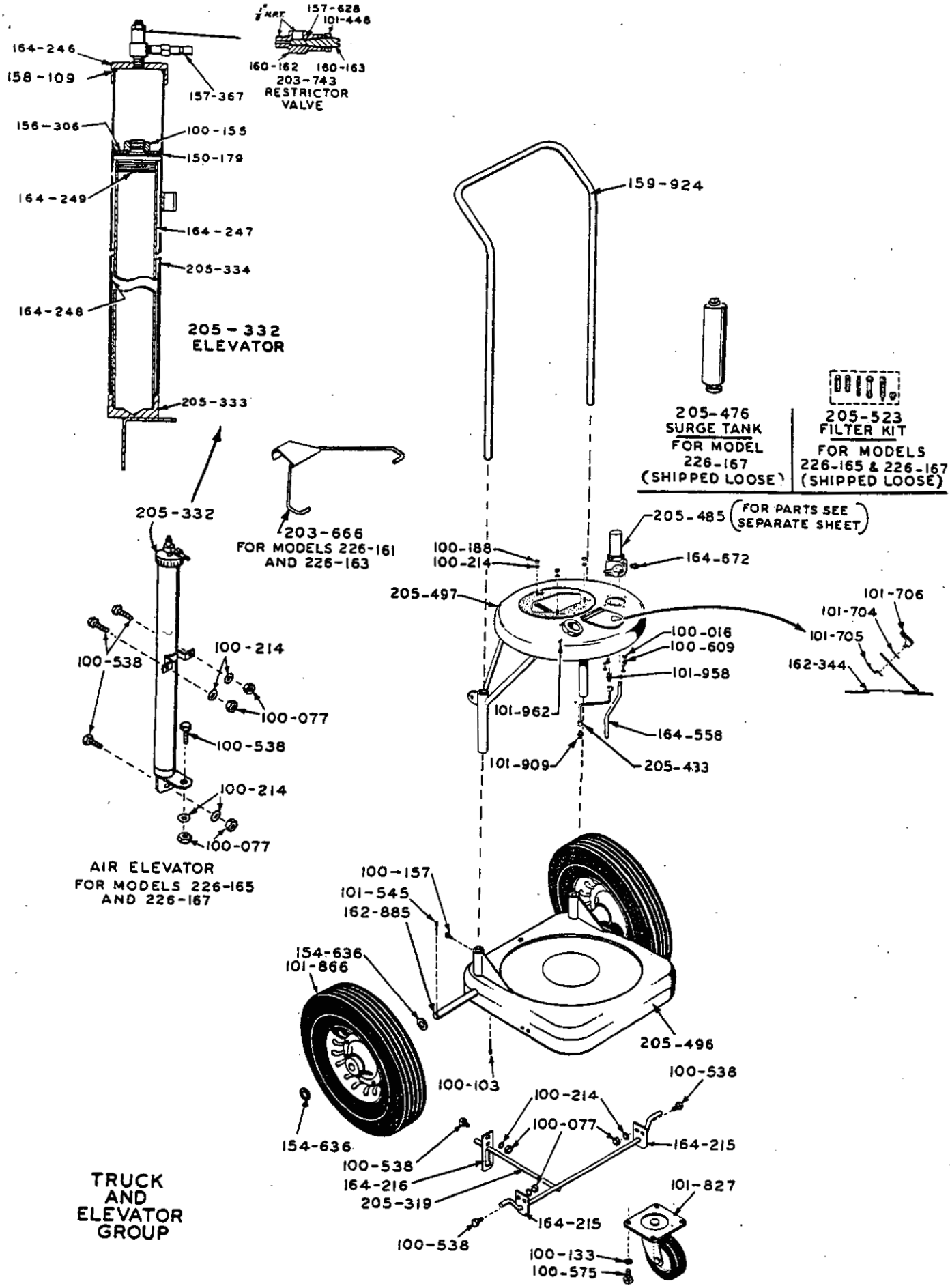
202-437
AIR LINE COUPLER



204-940
STRAIGHT SWIVEL



205-306
STRAINER


157-628
101-448
160-162
160-163
203-743
RESTRICTOR VALVE
164-246
158-109
157-367
156-306
100-155
150-179
164-249
164-247
205-334
164-248
205-333
205-332
ELEVATOR
205-332
203-666
FOR MODELS 226-161 AND 226-163
100-214
100-538
100-077
100-538
100-214
100-077
AIR ELEVATOR
FOR MODELS 226-165 AND 226-167
159-924
205-476
SURGE TANK
FOR MODEL
226-167
(SHIPPED LOOSE)
205-523
FILTER KIT
FOR MODELS
226-165 & 226-167
(SHIPPED LOOSE)
205-485
(FOR PARTS SEE SEPARATE SHEET)
100-188
100-214
164-672
205-497
101-706
101-704
101-705
162-344
100-016
100-609
101-958
101-962
164-558
101-909
205-433
100-157
101-545
162-885
154-636
101-866
205-496
100-103
154-636
100-538
100-214
100-077
164-215
100-538
164-216
205-319
164-215
100-538
101-827
100-133
100-575
TRUCK AND ELEVATOR GROUP

This equipment has been carefully manufactured to exacting GRACO standards. It is warranted against defective materials and/or workmanship as set forth in the GRACO WARRANTY. Excessive wear due to passage of abrasive or corrosive materials through this equipment shall not be construed as indication of defective parts within the limitations of this warranty.

IMPORTANT NOTES

"PTFE" material hose is expensive. HANDLE WITH CARE. GRACO WARRANTY does not cover abuse such as sharp kinking, crimping or crushing.

Air supply hose 205-216 includes a static wire to effectively ground the unit. If additional air supply hose is required, it should be of the same type.

AIR REQUIREMENTS

Air pressures required to operate pump range from 20 to 100 p.s.i. CAUTION: Do not use more than 100 lb. of air pressure to operate pump.

During continuous operation, at normal working pressures and operating speeds, this unit will require actual air delivery of approximately 4 c.f.m. per gun plus 3 c.f.m. for continuous use of agitator.

To provide reserve capacity for peak load conditions compressor should delivery 25% more air than required for normal operation of all equipment which it is to serve.

NOTE: Consumption of compressed air is low, since in this Hydra-Spray process air is not needed to atomize the paint.

PREPARATION FOR OPERATION

1. Remove contents from carton and connect the wire-braided Dupont "PTFE" lined material hose 205-349 (15') or 204-938 (25') to nipple 164-672 protruding from material outlet manifold 205-485. Connect the end, without swivel 204-940 attached, to nipple 164-672. See Fig. 1. DO NOT connect swivel 204-940, attached to other end of this hose, to spray gun at this time. DO NOT USE THREAD SEALER AT ANY SWIVEL CONNECTION.

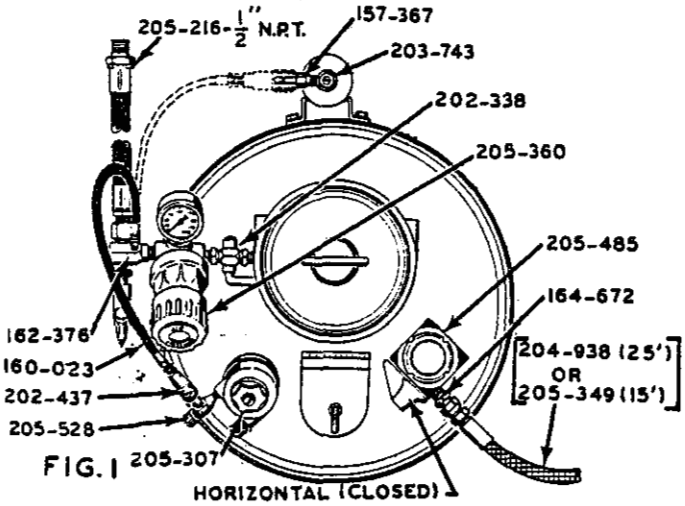


FIG. 1

NOTE: Check dump valve of manifold 205-485 ...it should be closed. When closed, its knob is in a horizontal position. Refer to Fig. 1.

2. For operation of a second spray gun purchase these accessories separately...two (2) high pressure material shutoff valves 205-583, a second hose 205-349 (15') or 204-938 (25'), a second swivel 204-940, a second spray gun 205-162 and a second spray tip of customers choice. Remove nipple 164-672 and plug from manifold 205-485, and connect valves and hoses as shown in Fig. 2.

3. Attach one end of 15 foot air supply hose 205-216 to source of air supply and screw other end of hose into air manifold swivel adapter 162-376. Refer to Fig. 1. Male hose studs are threaded ¼" NPT. Install a master air valve (drain or bleed type) in the air supply line in such location that air can be turned on and off before reaching unit. NOTE: A Graco air line strainer 204-999 (accessory) may be purchased separately for removing foreign matter from air entering the unit. Attaches to air manifold 162-376 as shown in Fig. 2.

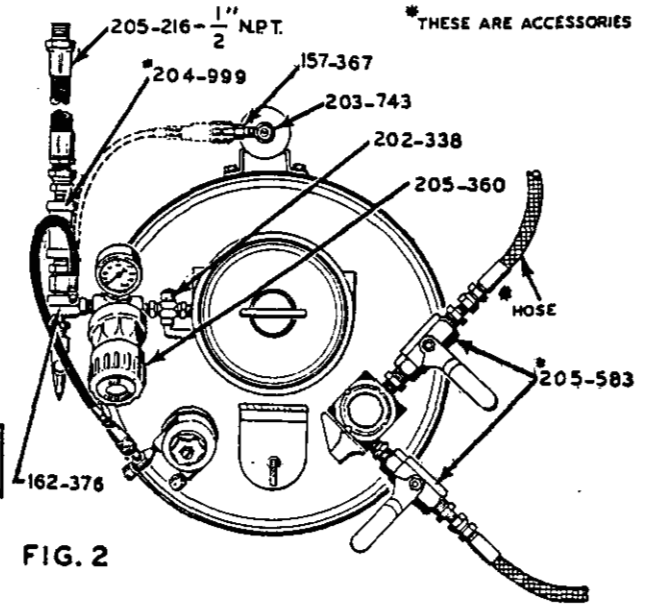


FIG. 2

NOTE: Models 226-163, 226-165 & 226-167 are equipped with a brake—to set brakes push down with foot on rod protruding from bracket attached to back of truck base and guide rod into notch at bottom of bracket.

4. If Model 226-161 or 226-163 with hand-operated elevator, lift up on elevator hanger and hook over handle. NOTE: If elevator is difficult to raise, apply a little grease to exterior surfaces of handle ends.

If Model 226-165 or 226-167 with air-operated elevator, disconnect air line coupler 202-437, attached to end of air hose 160-023, from air line fitting in agitator 205-307 and connect to air line fitting 157-367 atop elevator as shown in Fig. 1. With air admitted to unit, elevator will raise unit and hold it there until air hose 160-023 is disconnected.

5. Remove from base the 10 gallon pail provided. Wipe clean its interior and pour into it material stirred and thinned to the proper spray consistency or place a smaller container of material inside the 10 gallon pail. Stir material thoroughly making sure there is no heavy pigment concentration or cake formed on the bottom of the container. The pigments must be well dispersed to prevent them from clogging the fluid intake strainer 205-306 when the pump is initially lowered into the container of material.

NOTE: For a small container, such as a one gallon can, the material intake strainer must be removed in order to get the lower pump housing and the agitator propellor into the container.

6. Check the position of foot valve feet in relation to the perforated plate 162-363 of pump fluid intake strainer. When the plate and screen are held in position by the retaining ring 162-416, the feet of foot valve body must contact and support the perforated plate 162-363 as shown in Fig. 3.

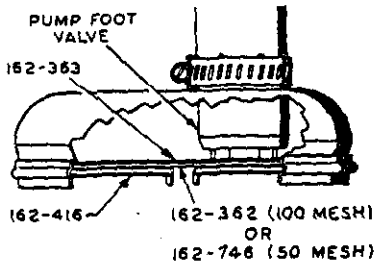


FIG.3

NOTE: If desired, the 100 mesh screen in strainer 205-306 can be removed and replaced with the extra, more coarse 50 mesh screen 162-746 supplied. Refer to Fig. 3. This 50 mesh screen should be used with spray tips having larger orifice openings.

7. Lower pump into material. If unit with manual elevator, unhook hanger to lower. If unit with pneumatic elevator, lower by disconnecting air hose 160-023 from elevator air line fitting. Refer to Fig. 1.

NOTE: The speed at which unit is elevated, by air, is set at factory. If adjustment is necessary, loosen lock nut of air restrictor valve 203-743 and turn restrictor screw clockwise to decrease or counterclockwise to increase. Lock screw in place with lock nut when adjustment is completed. Air restrictor valve 203-743 is located atop elevator tube. Refer to Fig. 1.

8. If unit includes a filter kit 205-523 or a filter kit 205-523 and a surge tank 205-476, refer to illustrated instructions in separate Form 306-696 for easy conversion of manifold 205-485 to a filter or a filter-surge chamber.

9. Insert delivery end of material dispensing hose into a waste container. Start pump by opening ON-OFF pump air petcock 202-338 and setting regulator 205-360 at 30 p.s.i. Refer Fig. 1. Allow pump to operate until all traces of rust inhibiting oil, with which pump was treated, is removed. Stop pump and discard material pumped.

NOTE: If accessories have been added to unit for two gun operation, open material shutoff valves 205-583 and insert ends of both hoses into waste container before starting pump. Refer to Fig. 2.

10. Connect swivel 204-940, attached to free end of material dispensing hose, to spray gun inlet.

OPERATION

IMPORTANT NOTES

1. For most satisfactory operating conditions, locate pump and material so that they will not be subjected to temperatures below 65° F.

2. Do not attempt to spray materials containing heavy fillers, dirt or other coarse particles. Coarse grind, coagulated, contaminated and skinned materials that will not pass freely through the openings in size of screen or filters being used, without clogging, can not be satisfactorily sprayed. Due to the extremely small orifice diameter in spray tip through which material must be forced under pressure, it is very important that particles which could plug this orifice are not present in the material to be sprayed.

3. Daily, before starting to spray, remove and clean filter, if used, of spray gun.

4. Daily, with air pressure shut off and relieved, remove and clean screen in air line strainer 204-999 (accessory), if used. Add light oil to screen cavity in strainer nut. See Fig. 4.

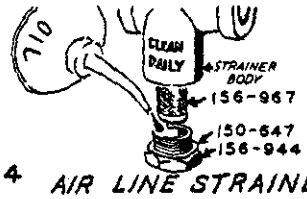


FIG.4 AIR LINE STRAINER

5. Daily or more often if experience indicates necessary, WITH PUMP DEACTIVATED AND FILTER DUMP VALVE OPEN TO RELIEVE MATERIAL PRESSURE, remove and clean filter cartridge or screen, if used. Refer to Fig. 1.

6. Daily, remove and clean screen in pump material intake strainer 205-306. When replacing, check to be sure that plate 162-363 is in contact with feet of pump foot valve. Refer to Fig. 3.

7. When thinning material; cleaning filters, screen, tips, etc.; changing types of material to be sprayed or flushing unit; be sure to use CLEAN solvent of a type recommended by manufacturer of material being sprayed. Use of the wrong solvent may cause jelling or separation of material components which could cause clogging of strainer, filter and spray gun tip. DO NOT USE COMMON GUN CLEANER.

NOTE: If manufacturer of material does not recommend a specific type of solvent, check the compatability of the solvent to be used for thinning the material by dropping a single drop of the material into a small container of the solvent. If the material drop clouds or disperses readily, the solvent is compatible. If drop tends to string or form a ball, the solvent is not compatible and definitely should not be used.

AGITATION OF MATERIAL

Thorough agitation of material should be accomplished prior to pumping material to spray gun. Agitation can best be obtained as follows:

1. Snap air line coupler 202-437 onto agitator air fitting and agitator will be energized. Refer to Fig. 1.

2. Turn agitator air valve 205-528, two or more turns to the left to start agitator air motor. Refer to Fig. 1. Speed of agitation may be adjusted to suit the particular viscosity of material used. NOTE: Excessive agitation speed may cause vibration and foaming of material. Use moderate agitation speeds at all times.

3. Open manifold dump valve and start pump. This permits pump circulate the material under light load.

4. Lift hinged inspection plate and examine progress of agitation through hole in cover. It is extremely important that all solids are put in suspension and held there during the entire spray operation.

5. Allow agitator to continue operation while unit is supplying material to spray gun.

SUPPLYING MATERIAL TO GUN

1. Stop pump and close manifold dump valve after material has been circulated sufficiently and before attempting to spray. When closed, knob of dump valve is in a horizontal position.

2. Open material shutoff valves 205-583 (accessory), if used. Handles are parallel to valve body when open. Refer to Fig. 2.

3. Open ON-OFF pump air control petcock 202-338. With petcock open, manifold dump valve closed and air regulator 205-360 set to control the air pressure admitted, the pumping action of pump is controlled by operation of spray gun. Squeezing trigger of spray gun open automatically starts pump operating, forcing material, under pressure, from gun spray tip.

4. Adjust pump to minimum pressure required to obtain desired breakup and spray pattern of material. This setting will vary due to viscosity material, orifice diameter and fan angle of spray tip. To increase air pressure to pump, turn adjusting knob of regulator 205-360 clockwise and to decrease pressure turn it counterclockwise. NOTE: The amount of air pressure supplied to the pump determines the pressure of the material forced through the orifice in spray tip. Pump develops material pressure 28 times that of the inbound air pressure. Do not set higher than 100 p.s.i.

5. While spraying be sure at all times to hold spray gun perpendicular (approx. 90°) to surface to be sprayed, with its spray tip 12 to 14 inches from surface or greater if the material spray will cover satisfactorily. NOTE: Good Hydra-Spray technique is very similar to conventional spraying with air, except for the greater distance spray tip should be held from work surface, the larger coating thickness produced which results in less pattern overlapping and the positive action used when triggering gun.

NOTE: Refer to the SERVICE DIAGNOSIS CHART in this Instruction Sheet for assistance in locating troubles which may occur during spraying. Also refer to separate Instruction Sheets for specific information pertaining to the spray gun, pump, regulator and manifold or filter.

SAFETY PRECAUTIONS

The Hydra-Spray equipment develops extremely high material pressure which remains in the system until relieved by shutting off the air to pump and releasing the material pressure by opening manifold dump valve. In operation, if the fine high pressure stream of material released from spray gun is allowed to come in direct contact with the hand or any part of human body it could penetrate the skin and cause physical harm.

HANDLE THE HYDRA-SPRAY GUN AS CAUTIOUSLY AS YOU WOULD ANY GUN: LOADED OR UNLOADED. The following safety precautions should be observed:

Never point gun directly at the face.

Never put the hand or fingers directly over the spray tip. (Use of protective leather gloves is recommended.)

Never place the tip or gun nozzle directly in contact with any part of the body.

Always shut off air pressure to pump and relieve material pressure in system before attempting to remove gun tip or screen and/or removing gun for service.

Always remove tip from gun to clean it.

Always tighten threaded connections carefully and securely, and handle hose carefully to prevent leaks that could cause physical harm same as pressurized stream coming from orifice in gun tip.

Always be sure that the equipment supplying the material to spray gun is properly grounded to prevent sparking. The high velocity flow of material through the spray tip may cause static electricity to be developed. Use only metal braid material dispensing hoses or static protected hose. Also be sure to provide for the proper grounding out of the compressor.

PREVENTIVE MAINTENANCE

At least twice daily and during any lengthy interruption of spraying, with material pressure relieved, remove and clean gun spray tip and tip filter in clean solvent of a type recommended by manufacturer of the material being sprayed. Blow parts dry with air pressure. Also immerse gun nozzle in clean solvent during shut down periods.

SHUTDOWN PROCEDURE

To maintain efficient operation of unit, this shutdown procedure at the completion of each day's spraying must be diligently followed:

1. Shut off air to pump by closing pump ON-OFF air control petcock 202-338. See Fig. 1. Handle is at right angle to petcock body when closed.

2. Relieve material pressure in pump, hose and spray gun by opening drump valve of manifold. This will allow the material trapped in the system to drain back into material container. After material has stopped draining, remove and clean filter cartridge or screen, if used. Close drain valve.

3. Remove spray tip and filter, if used, from spray gun. Immerse in clean recommended type solvent and wash thoroughly with a fine bristled brush. Using the air blower valve 205-541 attached to air manifold 162-376, blow air through tip from front to back and through open end of filter. Refer to Fig. 1. Keep spray gun forward end submerged in clean recommended type solvent until ready to start spraying again. NOTE: Do not remove the spray gun from dispensing hose unless the unit is to be completely flushed. Keeping unit fully charged with material will minimize the necessity for flushing unit.

CAUTION: Water based paints will require a final flushing with solvent DAILY and also oiling of all external moving pump parts to prevent the rusting of the wetted parts. To completely flush unit follow the procedure outlined in subsequent paragraph entitled FLUSHING UNIT.

SERVICE DIAGNOSIS

TROUBLESOME SYMPTOMS	CHECK POINT NOS.
Pump fails to operate, no material discharge	1-3-4-6-8-9
Pump operates, but insufficient material discharge	2-4-7-14
Excessive surge at spray gun	1-2-9-10-12
Insufficient material breakup	1-2-3-4-6-9-11
Tails in spray pattern	1-2-4-6-11
Spray gun spitting	13
Too heavy a coating thickness	5-10-11

CHECK POINT NO.	POSSIBLE CAUSES
1	Restricted air supply line.
2	Insufficient air capacity.
3	Air valve closed or clogged.
4	Air regulator inoperative or set too low.
5	Air regulator set too high.
6	Material too viscous
7	Insufficient material in container.
8	Clogged material intake strainer.
9	Clogged material filter, tip or tip filter.
10	High flow rate—tip orifice too large.
11	Improper or worn spray gun tip.
12	Surge chamber inactive, if used.
13	Worn, damaged or obstructed gun parts.
14	Worn or obstructed pump valves or packings.

MAINTENANCE

IMPORTANT NOTES

1. Keep unit, mixing container, thinner, solvent, and material CLEAN and free of foreign particles which could clog strainer screens and/or plug the small orifice in spray tip.

2. Keep lower pump assembly filled with and spray gun head immersed in recommended type clean solvent after flushing unit and until ready to start spraying again.

3. To relieve unit of unnecessary pressure when not in use, shut off air pressure to pump and relieve material pressure in system by opening dump valve of manifold or filter.

4. Daily or more often if experience indicates necessary, drain filter or surge tank, remove filter cartridge or screen, if used, and clean. Before draining tank and removing filter cartridge or screen, shut off air pressure to pump and relieve material pressure by opening dump valve. Replace cartridge or screen after cleaning and close dump valve.

5. If surge tank 205-476 is being used without filter parts installed, it should be drained as often as experience indicates necessary. Stop pump and open dump valve. After material has drained completely from tank, close dump valve.

6. Shut off air pressure to unit and relieve pressure in air line, before removing screen 156-967 in air line strainer 204-999 (accessory if used). Daily, clean this screen and at reassembly add light oil to screen cavity in nut 156-944. Refer to Fig. 4.

FLUSHING UNIT

The frequency with which unit should be flushed depends upon type or types of material pumped, general operating conditions, and usage of unit. It is wise to establish a regular flushing schedule. In some instances it may be desirable to flush unit daily while in other cases less frequent flushing may prove satisfactory. Unit must be flushed at the end of each working week. Thoroughly flush unit with thinner or solvent of type recommended for use with the material, as follows:

1. Remove spray tip and gun filter cartridge, if used, from spray gun and soak in clean recommended type solvent.

2. With air supply to unit turned on, disconnect air hose to agitator and connect it to elevator to raise unit or manually raise and hook hanger over truck handle.

3. With pump air petcock 202-338 open, direct spray gun into material container and start pump operating by squeezing trigger of spray gun. Unit will pump air, forcing the material out of the system back into container. When the air has flushed out as much material as possible, stop pump and open manifold dump valve. Drain excess material from all loops in hose. After material has stopped draining, close manifold dump valve.

4. Remove container of material from base and position in its place a pail containing approximately 2 gallons of compatible solvent. Lower pump into pail of solvent.

5. Set air to pump at approximately 20 p.s.i., direct gun to material container and trigger gun to start pump. Pump will move the solvent, under pressure through the system, flushing the internal cavities of manifold and filter or surge tank. When solvent appears at gun, stop pump, release pressure in system and remove spray gun.

6. Remove spray gun from hose and thoroughly clean in accordance with procedure outlined in separate Instruction Sheet for the spray gun. Keep spray gun head immersed in solvent until attached to hose again.

7. Direct end of material hose into pail of solvent and start pump by opening air line petcock 202-338. Allow thinner or solvent to circulate through system and back into pail for a period of 10 to 15 minutes. Wash material from exterior of lower immersion pump.

8. After thoroughly flushing unit stop pump and connect material hose to spray gun. Squeeze trigger of spray gun and open air line petcock to start pump. Allow pump to operate long enough to fill hose and spray gun with solvent. Keep unit filled with solvent overnight or weekend until ready to spray again.

9. Recirculate solvent for about 5 minutes prior to charging unit with material.

10. Close spray gun and raise pump. Start pump operating, by squeezing trigger of spray gun and continue operating until most of solvent has been blown out of system. Drain excess solvent from loops in hose and filter or surge chamber, if used. After draining tank of filter or surge chamber, close its dump valve.

11. Replace container of material upon base, lower pump into container, connect air hose to agitator and charge unit with properly mixed material.

NOTE: When changing colors or incompatible types of material, flush unit as described, HOWEVER, a longer circulation period will necessarily be required and in some cases a second flushing using clean thinner or solvent may be necessary. Also if manufacturer of another type of material to be sprayed recommends using a different type of thinner or solvent, the thinner or solvent used in the first flushing must be flushed out to eliminate the possibility of separation or jelling of material components. The surge tank or tank of manifold or filter should be removed and parts thoroughly scrubbed clean. Surge tank is equipped with a removable plug to facilitate cleaning.

AGITATOR

Agitator air motor 101-687 must be properly oiled with a light air motor oil, whenever unit is shutdown or is not to be operated for a period of 8 hours or more. All compressed air contains some moisture and if air motor is not properly lubricated before shutdown, rust may result. To oil motor:

1. Remove oiler screw from air motor top.
2. Apply 3 to 4 drops of oil to oiler.
3. Replace oiler screw and run motor for about 1/2 minute.

Air motor should require no attention other than to be oiled. However, if too heavy an oil has been used or other improper oiling practices have been followed gumming of rotor may result, in which case air motor should be flushed as follows:

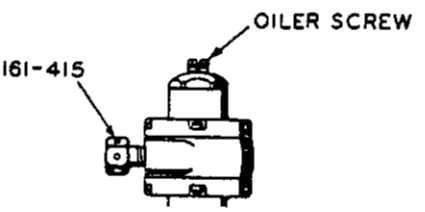


FIG. 5

1. Remove exhaust muffler 161-415. Fill to overflowing with kerosene. Replace muffler.

2. Remove oiler from air motor top cap. See Fig. 5. Fill oiler with kerosene. Replace oiler.

3. Allow a soaking period of 5 to 10 minutes, then start air motor. Run motor slowly. After smooth operation has been achieved and kerosene has been blown from exhaust, stop motor, remove oiler screw and fill oiler with a light air motor oil.

NOTE: MAKE NO ATTEMPT TO DISASSEMBLE AIR MOTOR. If it should need repair, contact your nearest Graco Authorized Service Depot.

FLUID SHUTOFF VALVE
205-583 (ACCESSORY)

Worn "O" rings, ball seat or ball may cause valve to fail to operate. If service is necessary, shut off air supply, relieve fluid pressure and remove valve. Place valve body in a vise and drive the two pins out of holes in valve body. Remove valve cap from body being careful not to turn cap as this would shear off the locating pins in valve body. See Fig. 6. Disassemble and replace any worn or damaged parts. NOTE: With handle removed, "O" ring 154-741 can be best removed by first removing ball 162-834 from body and then pushing handle shaft down into cavity in valve body.

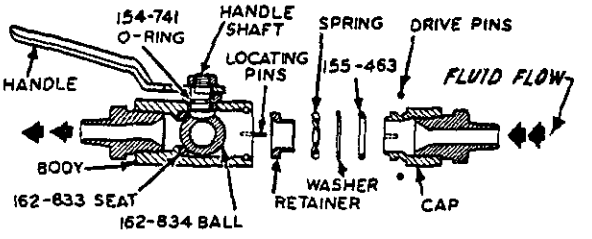


FIG. 6

ELEVATOR

LUBRICATION

Every 2 to 6 weeks with elevator free of air pressure, unscrew and remove cap 164-246. Fill inner cavity of cup leather 150-179 with SAE 20 oil. Replace cap. Raise elevator and lubricate exposed surface of elevator guide tube 164-247. See parts illustration for location of parts.

PUMP, REGULATOR, SPRAY GUN AND FILTER OR SURGE CHAMBER

Refer to separate sheet for maintenance instructions and parts identification.

REPAIRING HYDRA-SPRAY HOSE

Hydra-Spray hose is constructed of Dupont "PTFE" inner lining tube with stainless steel wire braid outer cover. This hose is expensive and should be handled with care. If hose should become damaged it can be salvaged by assembling couplings to the broken ends of hose sections. Graco detachable and reusable couplings consist of two parts, the female swivel stud 204-937 and the sleeve 162-366, and are assembled upon hose in the following manner:

NOTE: A hose coupling fixture Graco No. F-20898 specifically designed to facilitate the assembly of couplings upon this type of hose may be obtained from factory. This fixture consists of a two piece assembly block and an assembly tool as shown in Fig. 7, 8 and 9.

1. Position the two piece assembly block on hose with plain side of block toward hose end to be cut and clamp in a vise as shown in Fig. 7. Cut off with a fine tooth hand hack saw.

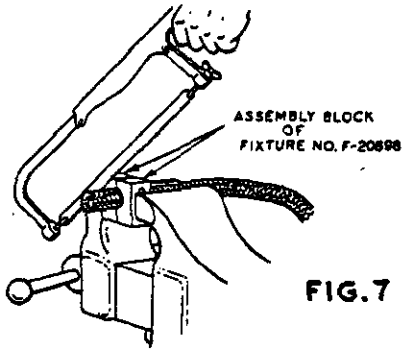


FIG. 7

2. Remove hose from block and grip in vise about 2 inches from end just cut. CAUTION: Do not crush the hose--apply only enough pressure on the vise jaws to hold while forcing the sleeve onto hose.

3. Add a drop of oil to the end of the wires, position assembly block with its grooved side toward end of hose just cut and slide block onto hose until it protrudes about 1/32 to 1/16 of an inch beyond the end of hose. See Fig. 8.

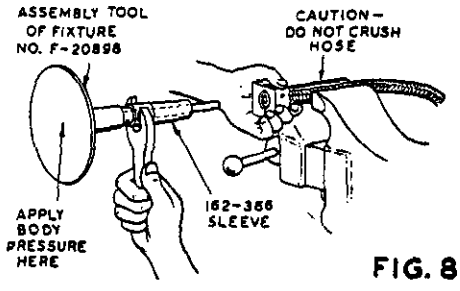


FIG. 8

4. Slip the threaded end of sleeve 162-366 over assembly tool as shown in Fig. 8 and while holding block in place on hose, insert end of tool into hose and end of sleeve into groove.

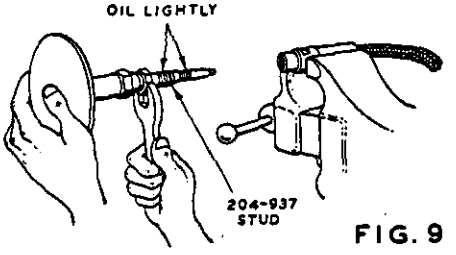


FIG. 9

5. While twisting sleeve back and forth with a wrench apply body pressure to assembly tool and as sleeve is forced onto hose allow block to slide back. After about $\frac{1}{2}$ inch of hose is covered, remove the block and continue to force sleeve onto the hose until end of hose reaches the shoulder in sleeve. Refer to Fig. 10.