LONG TRIP FISH HAULER

By Gio Fedon, I.A.S., NANFA
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The idea for this project was born several years ago while visiting family in the Philadelphia area. One day I took my boys and several of their cousins on a frog hunting and minnow netting trip to a nearby stream. We netted several fish that I could not identify and which I would have liked to bring back to Indianapolis. An attempt to do this using oxygen charged plastic bags was not successful.

Before continuing with what is essentially a how-to article, I'd like to mention that anyone who takes a road trip to the Atlantic coast states and doesn't take a little time to check the streams is missing a good chance to acquire unusual fish. Not only natives that do not inhabit Indiana waters, but real "exotics". Caribbean natives are swept north by the Gulf Stream and can be found in almost any salt marsh from Georgia to New Jersey. Some find their way into rivers and thence to fresh water streams ---- surviving the transition from warm marine to cool fresh water. Some people speculate that they even breed and establish isolated communities of environmental mutations. I have not verified this but since Sculpins are native to Indiana I am willing to believe it!

Last summer I started experimenting with ways to transport native fish from collecting sites to my home and the above mentioned incident came to mind. I decided that having a container to use on long trips as well as short ones would be my goal. It would need provisions for filtration and aeration and a heater for use with tropicals --- and a spill-proof top. I checked several pet stores for battery operated filters/aerators and heaters but managed to get only blank looks. A few letters to power filter manufacturers requesting information on 12 volt models have gone unanswered.

When faced with this sort of situation I check my main source of supply ---- neighborhood trash ---- for items that may spark ideas. In this case I found an old cooler of about 15 gallon capacity with several rust holes and a rotten gasket. A garage sale produced a Dynaflow model 410 power filter that "squeaked" for $2.50 and a heater motor from a 1954 Valient for $1.50. These three items formed the basis for my long trip fish hauler.

The how-to of this article cannot be specific because it will depend on the container, filter and replacement motor you use. In a way it is like a spawning report; I can write what worked for me, and the reader can modify my method to suit his needs, tools or raw materials.

The cooler required little work. I removed the gasket, steel-wooled the lip and the rust spots and applied a coat of Heddy Rust Treatment to the exposed metal. The right side of the

cooler seemed to be a good place for the filter so I temporarily positioned it there, marked where the siphon and return tubes would be and then cut slightly oversize slots in the lid to take the tubes. A Billion Bubbles attachment was added to the return tube and the slot cut accordingly. Pieces of boat resin soaked fiberglass were used to line the slots and cover the rust spots that had eaten through. When cured these were trimmed and sanded and the whole cooler given a coat of epoxy base enamel. A piece of 3/4 inch hollow rubber spline was miter cut to cooler dimensions and silicone cemented to the lip except in the eight inch section where the filter was to be mounted under the spline. Spillage around the tube slots and from the filter itself can be minimized by stuffing and wrapping with plastic food wrap. Spillage and/or breaking the siphon action will not be a problem unless you are traveling over extremely irregular surfaces such as Indianapolis' public thoroughfares or newly plowed cornfields.

The next step was to convert the Dynaflow to operate on vehicle voltage by replacing the 177 VAC motor with a 12 VDC unit. This can be done to other power filters but I used and recommend the Dynaflow because of its availability and low cost. The following procedure is for the Dynaflow only. Start off by removing the motor cage and then removing the motor from the base. The motor wires are connected to the switch and power cord with insulated screw connectors so no desoldering is necessary. Removing the drive magnet from the motor shaft is frustrating. The best ways are to use a bearing puller or drilling out the shaft. If you don't have a suitable bearing puller check with your service station or a watch repairman. If you drill out the shaft use an undersized bit and drill only deep enough to relax the sweated fit. The shaft is 1/8 inch so a 3/32 or 7/64 bit should be used and drilling 3/16 inch deep should do. Work carefully, this magnet is not a part you can get from the Dynaflow parts display at your local pet shop. Don't throw the old motor away -- this type of induction motor can be used as a replacement in record players, desk fans, etc.; or to make an air compressor from a discarded model engine, a project that may be presented in the future.

If you do not want to take the effort to remove the old magnet or damage it in the attempt, a suitable replacement can be made from a round magnet of similar size available at electronics parts outlets. The magnet must be flux insulated from the motor shaft so get one that will allow drilling and inserting a brass or fiber standoff (available at the same outlet as the magnet). Before drilling, check the position your replacement motor will be in. If the shaft is not long enough to properly position the magnet a longer stand-off can be used and it can be cemented to the bottom of the magnet rather than cemented within. Of the available magnets, avoid ceramic types--they will shatter under normal drilling. Metal types, especially Alnico and Alcomax, are magnetically strongest but plastecized powdered iron types are the easiest to work with. Depending on the materials used, the magnet, insulator and motor shaft can be sweat-fitted or epoxied together.

Place the replacement motor in its approximate position and mark if any shaft must be removed for clearance. If using a sweated fit, attach the magnet to the shaft before mounting the motor permanently. If using epoxy it is easier to mount the motor first and then position and cement the magnet. How you mount the new motor depends on its size, shape and built-in mounting provisions. I recommend a motor designed for constant operation such as a car's heater motor, but I am sure heavy duty 12 volt toy motors (like used in some children's go-karts) will work. A 12 volt slot car motor, and these are available from 39¢ to over $5.00, might work, but I think the RPM is too high and the cheaper models will not hold up in constant operation. If you have a choice of motors try to get one with a double ended shaft --- the rear end can have a home-made fan blade attached to control the RPM. The "fan blade" is made of a circle of sheet aluminum with eight slots cut in it. Each section is warped to create a blade -- the greater the twist the greater the slowing effect on the motor.

The car heater motor that I used had front mounting provisions so I attached it directly to the base of the Dynaflo motor housing. If it did not have these provisions I would have run long machine screws through the base and cover and attached the motor to these with hose clamps. Other methods of mounting include cementing the motor to the base or a hole cut in the base, to the cage or a hole cut in the cage, or to pieces of scrap plastic cemented to the base and/or cage. The only important thing in mounting the motor is that the drive magnet is in the same position as it was originally ----- the end justifies the means.

My motor had a 3/16 inch shaft, so I drilled out the magnet's brass core 11/64 and worked the motor shaft with 280 grit emery cloth until it almost fit. The motor was placed in the freezer for an hour and then the magnet was heated with a butane torch and slipped onto the motor shaft. When temperatures equalized I had a tight sweated fit. When I make another hauler, (and I will since I sold the first one at a price I couldn't turn down) I will try using a "plastic" magnet from an "Action Football Game", drill it for a fiber insert and assemble these to the motor shaft with an epoxy cement.

When all this mounting is completed, wire the motor to the switch and power cord using the connectors removed earlier. This leaves the switch operative and gives you a cord to hook up to the car's electrical system. The cord is probably too short to reach a good spot, so the following may prove worthwhile. In fact, you might want to try this even if you don't plan to build a fish hauler. Take a 12 foot extension cord and cut off about two feet of the male end. Part of this will be used later in this project or can be used to repair a table lamp or something else around the house that has an inoperative plug. Take the remaining ten foot section and wire it into the car's fuse/reset block. I suggest the cigarette lighter terminal because it has the huskiest fuse and is usually "hot" even when the ignition is turned off. Some cars have an unused fuse holder in the block and this may be even better. Determine which side is

"hot" and wire the extension cord to the other side and to the car's ground. Install a fuse and you're ready to operate. The rating of the fuse should be determined by what you plan to plug into the other end of the cord--electrical razor, coffee maker/ heater, spotlight, etc. The converted filter with heater draws 2 amps, so I used a three ampere fuse. The extension cord will reach all areas of a standard size car including the trunk as well as an outside area and this is handy at picnics. When not in use it can be wound up and stored under the dash.

Up to this point we have a container and a filter/water circulator/aerator. For natives this is all that is needed since the cooler keeps water temperatures fairly stable even in the cars trunk. For tropicals, especially in winter, a heater should be added. My first idea was to use a 12 volt "coffee warmer" coil but several problems were apparent. One, it draws too much current; two, it would require constant checking of temperature and manual operation ----- difficult if the hauler was in the trunk. What I wanted was a low wattage unit with a thermostatic switch, and this can be made at a reasonable cost.

For the heating element, take a foot of 16 or 18 guage solid copper wire, strip off the insulation and tensilize (put one end in a vise and pull on the other end until you feel a slight "give"). If you don't have any wire around the house check any construction site and you'll find discarded pieces all over. After tensilizing the wire, cut it in half. Take 24 resistors (½ watt, 300 Ohm, carbon ----- don't worry about the tolerance, get the cheapest but make sure that they are all ½ watt, 300 Ohm and carbon or composition not wire-wound). Bend their leads at a right angle about 1/8 inch from the body. Line them up like tin soldiers, step-ladder fashion but touching, crimp one set of leads to a pice of your copper wire and solder. Repeat on the other side with the other piece of wire. Solder a one foot piece of lamp cord (cut it off the two foot piece of extension cord used earlier) to the busses (that's the two pieces of copper wire) at one end of the resistor array and trim off all excess leads--resistors, busses and lamp cord. At this point you should have 24 parallel resistors measuring roughly three inches long, 3/4 inch wide and 1/8 inch thick with a cord attached to one end. Encapsulate the resistors and at least one inch of the lamp cord with waterproof sealer. Epoxy potting compound would be the best, but three coats of epoxy cement will work. Make sure each coat completely covers and is cured before applying the next coat. The finished product is a 12 watt immersible heating element! Because it is immersed and does not have a glass tube and air space insulation, it will dissipate heat at the same rate as a standard 50 watt heater -- at one quarter the current consumption.

Several considerations went into the design of this element. If the car is parked overnight, such as during a motel stay and the heater is in constant operation what is the maximum current draw that would not cause car starting problems the next morning? The consensus is 10% of the cold cranking power. The smallest battery used in American cars is rated at 200 Amp therefore 20 Amp would be available for the filter and heater. This

works out to two amperes per hour for a ten hour period. The filter motor uses one Amp so one Amp is left for the heater --- one Amp at 12 volts is 12 watts! A single 12 watt resister would offer only one half square inch of surface for heat dissipation but 24 half watt resistors offer over three square inches ----- much better heater efficiency (and cheaper since a 12 watt, 12 Ohm resistor would be a special order item). An immersible unit of this size can be placed in the filter with a constant flow of water over it. The meager heat energy produced, 12 joules, is sufficient to maintain water temperature in an insulated container such as a cooler at 70° to 80° even when "outside" temperatures drop below freezing.

Pre-packaged resistors are available in the hi-fi section of most department stores at two for 25¢. They are also available at electronics parts outlets for 8¢ each or less. Check Graham's at Glendale or downtown (or any other industrially oriented electronics store) -- you may find 20% tolerance resistors as low as 5¢ each. The 300 Ohm rating is very popular ----- it is used as a ballast on unused TV antenna terminals ---- and if you shop around you can cut the cost of this heater assembly appreciably.

The thermostatic switch is made from a regular tank heater. Most of us have at least one heater with a burned out element or a broken glass tube but if you don't, check around the garage sales. Or check your local pet store for a "bad" heater that has a "good" switch and clamp ---- and a greatly reduced price! Separate the two pieces of the heater's plastic head and gently remove the contents of the glass tube. Remove the glass tube from the bottom piece of the head and replace it with a clear plastic or glass container of the same diameter and long enough to house the switch only, but not too long to fit into the heater. For Eureka and Metaframe heaters under 150 watts this is 7/8 inch diameter and 3-½ inch length. The limitation for a Dynaflo filter box is six inch length. There are plastic pill containers that are almost perfect --- almost because they are one inch in diameter but reaming out the hole in the heater's head piece is no great problem. If you do not have a suitable container check your local pharmacist ----- he'll probably give you one to establish or maintain good customer relations. Most pill containers have a lip and will stay in place when the head is reassembled. If you have one that is lip-less (or if you got overinthusiastic in reaming the hole in the head) cement the container in place with a bead of silicone sealer.

Take the top section of the head and remove the heating element, neon lamp/resistor circuit and disc capacitor. At this point you should have an AC cord with one lead attached to a terminal of the switch and the other "floating". The other terminal of the switch should also be disconnected. Take the 12 watt heater element made earlier and connect the leads to the disconnected AC cord lead and the disconnected switch terminal. The neatest way to do this is to connect one lead of the heater element to the switch terminal first, then trim the other lead so

it aligns with the AC cord lead. Twist these together. Take a small 12 volt lamp and solder a short lead to the side and center contact. Position the lamp so it does not interfere with switch operation and connect the leads parallel to the heating element. That is, one lead each to the two connections made earlier at the switch and AC cord. Solder the connections, trim excess wire and put a dap of silicone sealer on the AC cord/heater lead/lamp lead connection to insulate it. The reason for replacing the neon lamp is that it will not function at lower than 90 volts, but a lamp is convenient for adjusting the heater to maintain desired temperatures. A GE #53 lamp makes the best replacement, but a #57 or #158 is adequate. All are commonly available being used as panel lamps in such things as car radios.

When these connections are made reassemble the heater head running the AC cord and heater element cord through the same hole. The hole may have to be enlarged to do this. The heating element should be placed at the bottom of the filter under the platform and the head assembly clamped to the side or back, whichever position allows you to see the lamp. The male end of the AC cord plugs into the extension cord rigged earlier. One word of caution -- do not test, adjust or use the heater unless the element is immersed. If you do, you may melt the epoxy or burn out one or more resistors. This is the reason I recommend placing it under the filter platform ---- even if siphoning action is stopped, the pump will not completely dry out this area of the filter.

A few final suggestions. A set of inserts can be used to separate fish in the cooler, but make sure they have holes in them to allow water circulation. The siphon can be located in one section and returned in another ------ with water flow directed through each section as it goes from return tube back to siphon tube. When used on native fish collecting trips you might want to pack the filter with carbon, floss and "medications" to purify the water for later use at home. A good way to get soft and acid water is to "pick it up" at a local pond and "purify" it on the way home. It is also a good way to get cold pond water up to house temperature before pouring it in your tanks. The filter/heater is handy to have around if you anticipate any prolonged electrical power outages this year. Eight "D" cells wired in series for 12 volts will operate this unit for about 48 to 72 hours at average indoor house temperatures.